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REMARKS

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Libby Asbestos Superfund Site
The Former Export Plant Site,
Operable Unit 1
Lincoln County, Montana

Final Remedial Action Report

USACE Contract No. W9128F-11-D-0023
Task Order No. 0003

Reviewed by: _____ Date: 6/21/2013
Marc Schlebusch, P.E.
CDM Smith Senior Technical Reviewer

Reviewed by: _____ Date: 6/21/13
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Libby Asbestos Superfund Site
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Operable Unit 1
Lincoln County, Montana

Final Remedial Action Report

USACE Contract No. W9128F-11-D-0023

Task Order No.: 0003
EPA RPM: Dania Zinner

July 8, 2013

Prepared for:
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Abbreviations and Acronyms

AC	asphaltic concrete
ABS	activity-based sampling
AHERA	Asbestos Hazard Emergency Response Act
bgs	below ground surface
BNSF	Burlington Northern Santa Fe
CDM Smith	CDM Federal Programs Corporation
CHASP	Comprehensive Site Health and Safety Plan
City	City of Libby
cy	cubic yards
DEQ	Montana Department of Environmental Quality
ERS	Environmental Resource Specialist
FS	feasibility study
f/cc	fibers per cubic centimeter
ft^2	square foot
GPI	general property investigation
GPS	global positioning system
Grace	W.R. Grace and Company
HASP	*Health and Safety Plan*
IC	institutional control
ICIAP	Institutional Control Implementation and Assurance Plan
ISO	International Organization for Standardization
LA	Libby amphibole asbestos
JSI	joint site inspection
MDT	Montana Department of Transportation
ND	non-detect
NIOSH	National Institute for Occupational Safety and Health
O&F	operational and functional
O&M	operations and maintenance
OU	operable unit
PCM	phase contrast microscopy
PLM	polarized light microscopy
PPE	personal protective equipment
PRI-ER	Project Resources, Inc – Environmental Restoration, Joint Venture
QA	quality assurance
QAR	Quality Assurance Report
QC	quality control
RA	remedial action
RAO	remedial action objective
RAWP	Response Action Work Plan
RC	removal contractor
RG	remedial goal
RI	remedial investigation
ROD	Record of Decision
ROW	right-of-way
s/cc	structures per cubic centimeter
s/cm^2	structures per square centimeter
	Libby Asbestos Superfund Site

Site	Syracuse Research Corporation
SRC	transmission electron microscopy
TEM	third party quality assurance
TQA	U.S. Army Corps of Engineers
USACE	
≥	greater than or equal to
<	less than
%	percent

Section 1
Introduction

1.1 Site Name and Location

The Libby Asbestos Superfund Site (Site) (CERCLIS # MT0009083840) is located in and around the City of Libby (City), Montana. Libby is the county seat of Lincoln County and lies in the northwest corner of Montana, about 35 miles east of Idaho and 65 miles south of Canada. The Site is divided into eight operable units (OUs) (Figure 1-1).

OU1 encompasses an area of approximately 17 acres and is situated on the south side of the Kootenai River, just north of the downtown area of Libby, Montana. The property is bounded by the Kootenai River to the north, residential property to the east, the BNSF railroad thoroughfare to the south, and State of Montana property to the west (Figure 1-2).

The OU1 site was historically owned and used by W.R. Grace and Company (Grace) for stockpiling, staging, and distributing vermiculite and vermiculite concentrate to vermiculite processing areas and insulation distributors outside of Libby. Because vermiculite mined from Libby has been found to be contaminated with Libby amphibole asbestos (LA), a known human health risk, the U.S. Environmental Protection Agency (EPA) initiated an emergency response action in November 1999 to address questions and concerns raised by citizens of Libby regarding possible ongoing exposures to asbestos fibers as a result of historical mining, processing, and export of asbestos-containing vermiculite.

Based on current land use, the site on the west side of Highway 37 is divided into two distinct areas separated by City Service Road (also known as West Thomas Street): the area of the site to the south of City Service Road (approximately 12 acres) and a 4.7-acre recreational area known as Riverfront Park (formerly known as Riverside Park) to the north of City Service Road. For discussion purposes, these areas will be referred to throughout this report as Area 1 and Area 2, respectively. In addition, the embankments of Highway 37 on both sides of the highway on the south side of the Kootenai River, City Service Road, and Thomas Street are included as part of OU1 because of their immediate proximity to the site and the known presence of vermiculite. These areas will be referred to throughout this report as Area 3.

1.2 Key Features of the Libby Asbestos Superfund Site and OU1

1.2.1 Site OUs

To facilitate a multi-phase approach to remediation of the Site, eight separate OUs have been established. These OUs are shown in Figure 1-1 and include:

- **OU1.** OU1 is the subject of this remedial action (RA) report and includes the former Export Plant. OU1 is situated on the south side of the Kootenai River, just north of the downtown area of the City. OU1 includes the embankments of Highway 37, the former Export Plant, and Riverfront Park (formerly known as Riverside Park). The property is bounded by the Kootenai

River to the north, residential property to the east, the BNSF railroad thoroughfare to the south, and State of Montana property to the west.

- **OU2.** OU2 includes areas impacted by contamination released from the former Screening Plant. These areas include the former Screening Plant (Subarea 1), the Flyway property (Subarea 2), a privately-owned property (Subarea 3), and the Rainy Creek Road Frontages (Subarea 4). The Highway 37 right-of-way (ROW) adjacent to OU2 was included due to the proximity to OU2 and the known contamination in the ROW. For the purposes of this report, the contaminated portion of the Highway 37 ROW is considered part of Subareas 2 and 3 within OU2.

- **OU3.** The mine OU includes the former vermiculite mine and the geographic area (including ponds) surrounding the former vermiculite mine that has been impacted by releases from the mine, including Rainy Creek and the Kootenai River. Rainy Creek Road is also included in OU3. The geographic area of OU3 is based primarily upon the extent of contamination associated with releases from the former vermiculite mine.

- **OU4.** OU4 is defined as residential, commercial, industrial (not associated with former Grace operations), and public properties, including schools and parks, in and around the City, or those that have received material from the mine not associated with Grace operations. OU4 includes only those properties not included in other OUs.

- **OU5.** OU5 includes all properties that were part of the former Stimson Lumber Mill and are now owned and managed by the Kootenai Business Park Industrial Authority.

- **OU6.** The rail yard owned and operated by BNSF is defined geographically by the BNSF property boundaries and the extent of contamination associated with BNSF rail operations. Railroad ROW are also included in this OU and have not been geographically defined.

- **OU7.** The Troy OU includes all residential, commercial, and public properties in and around the Town of Troy, approximately 20 miles west of downtown Libby.

- **OU8.** OU8 is comprised of the US and Montana State Highways and secondary highways that lie within the boundaries of OU1, OU4, and OU7.

1.2.2 Site Contamination

This section provides information about the contamination in OU1 that existed at the time of the Record of Decision (ROD). All areas that were subject to previous investigation and removal actions but no longer pose a threat to human health and the environment will be monitored as part of the Selected Remedy. Previous investigations and removal actions are chronologically presented below.

OU1, from the early 1960s to approximately 1990, was used by Grace as the Export Plant for stockpiling, staging, and distributing vermiculite and vermiculite concentrate to vermiculite processing areas and insulation distributors outside of Libby. Ownership was transferred to the City in the mid-1990s.

The vermiculite deposit that was mined by Grace contains a distinct form of naturally-occurring amphibole asbestos that is comprised of a range of mineral types and morphologies. In various past reports, this form of amphibole asbestos has been termed interchangeably by the EPA as Libby Amphibole or more simply, LA. The term LA refers generally to amphibole materials that originated in the Libby vermiculite deposit, have the ability to form durable, long, and thin structures that are

generally respirable, can reasonably be expected to cause disease, and hence are considered the contaminant of concern at the site.

Because vermiculite mined from Libby has been found to be contaminated with LA and, known to cause human health effects, the EPA initiated an emergency response action in November 1999 to address questions and concerns raised by citizens of Libby regarding possible ongoing exposures to asbestos fibers as a result of historical mining, processing, and exportation of asbestos-containing vermiculite.

1.3 Site Background

Numerous hard rock mines have operated in the Libby area since the 1880s, but the dominant impact to human health and the environment in Libby has been from vermiculite mining and processing. Prospectors first located vermiculite deposits in the early 1900s on Rainy Creek northeast of Libby. Edward Alley, a local rancher, was also a prospector and explored the old gold mining tunnels and digs in the area. Reportedly, while exploring tunnels in the area, he stuck his miner's candle into the wall to chip away some ore samples. When he retrieved his candle, he noticed that the vermiculite around the candle had expanded, or "popped," and turned golden in color.

In 1919, Alley bought the Rainy Creek claims and started the vermiculite mining operation called the "Zonolite Company." While others thought the material was useless, he experimented with it and discovered it had good insulating qualities. Over time, vermiculite became a product used in insulation, feed additives, fertilizer/soil amendments, construction materials, absorbents, and packing materials. Many people used vermiculite products for insulation in their houses in and around the Site and soil additives in their gardens. In 1963, Grace bought the mine and associated processing facilities and operated them until 1990.

From the early 1960s to approximately 1990, the Export Plant was used by Grace for stockpiling and distributing vermiculite concentrate to Grace expansion plants, where vermiculite was heated and "popped" into its expanded form so that it could be used for insulation and other uses, and customers throughout the United States. Ownership was transferred to the City in the mid-1990s.

Throughout its history, portions of both OU1 Area 1 and 2 of the site have been leased to various parties for commercial and non-commercial enterprises. From approximately 1977 to 1997, organized youth baseball events (games and practices) were held at ball fields, which are centrally located in OU1 Area 1. Between approximately 1987 and 2000, the Millwork West Company, a retail lumberyard and building material supplier, leased the northwestern portion of Area 1. As described in Section 2 of this report, buildings and equipment used by Millwork West were removed and/or demolished as part of the removal activities conducted by Grace in 2001 and 2002.

Other commercial and industrial uses of the site also occurred in the past that utilized infrastructure at the site. These other commercial/industrial uses reportedly included a metal scrap dealer and a larch tree gum manufacturer. The infrastructure that supported these businesses included industrial power supply, a railroad spur, and truck scales. This infrastructure was removed during the removal activities conducted at the site.

1.3.1 Current Use

Area 1 is currently owned by the City and is undeveloped, with the exception of a small area of the site currently used by David Thompson Search and Rescue. In 2004, the search and rescue organization

constructed a building containing a main office and a five-bay garage on the northwest portion of the site on the south side of City Service Road. The garage is used for storing search and rescue equipment and vehicles. Several other agencies, including local and state law enforcement, also hold meetings in the main office. EPA has provided guidance to the City when conducting activities at the site that disturb soil.

Area 2, Riverfront Park, is also currently owned by the City and serves a variety of recreational visitors. The main features of Area 2 include two boat ramps, a pavilion, picnic tables, and a pumphouse. The newer of the two boat ramps is used by recreational boaters and commercial fishing outfitters; the older ramp is not commonly used due to swift current at its approach. The pumphouse houses a pump that draws non-potable water from the Kootenai River. The pump was installed jointly by the City and Lincoln County in 1999 to provide a backup water source to local fire departments. The pumphouse is accessed by City personnel in order to perform maintenance on the pump. The pump is connected to an external water spigot, which is used by the City to draw water for street sweeping and other maintenance operations, and for other workers (such as employees of local fill pits and contractors working on EPA's removal program) to draw water primarily for use in dust suppression equipment. Access to Area 2 is unrestricted.

Area 3 is owned and maintained by the Montana Department of Transportation (MDT). MDT currently performs only periodic maintenance of these embankments as needed. The types of maintenance activities conducted by MDT include application of herbicides, replacement of guardrails and guardrail posts, and replacement and maintenance of roadside light posts. Access to this area is unrestricted.

1.3.2 Future Use

Future use of Area 1 is a proposed City park. This RA report addresses the remedial activities that precede the park features development. The City expects that David Thompson Search and Rescue will continue to utilize the northwest portion of the site. A change in land use is not currently anticipated for Area 2 (Riverfront Park), though the river revetment to the east was refortified and is included in this RA report. It is also anticipated that Area 3 will not change use and will remain undeveloped and owned and maintained by MDT.

1.4 Report Organization

In accordance with the EPA guidance for National Priorities List site close-out procedures (EPA 2011a), this report is organized into the following ten sections and three appendices. Minor rearrangement of the section contents recommended by the guidance was made to the report for clarity.

- **Section 1 - Introduction**: provides a description and history of the site.
- **Section 2 - Operable Unit 1 Background**: provides a summary of the pre-ROD investigation and removal actions, the ROD requirements and remedial action objectives (RAOs) for OU1, and a summary of the remedial design.
- **Section 3 - Construction Activities**: provides a summary of the RA construction activities conducted and a summary of soil sample results.
- **Section 4 - Chronology of Events**: provides a chronology of major events for OU1, starting with the signing of the ROD.

- **Section 5 - Performance Standards and Construction Quality Control**: provides a comparison of current site conditions to the RAOs, a description of construction quality assurance and control, and brief overview of quality assurance/quality control (QA/QC) procedures employed.
- **Section 6 - Final Inspections and Certifications**: provides a summary of site inspections, adherence to health and safety requirements during the RA, and the approach for institutional controls (ICs).
- **Section 7 - Operation and Maintenance Activities**: provides a description of the monitoring and maintenance programs that will be in place to ensure that the selected remedy continues to provide protection of human health and the environment.
- **Section 8 - Summary of Project Costs**: provides a summary of project costs associated with the RA to present, including projected operations and maintenance (O&M) costs, and a comparison of actual costs to the cost estimates in the ROD.
- **Section 9 - Observations and Lessons Learned**: provides a description of successes, problems encountered, and solutions related to the RA implementation.
- **Section 10 - Operable Unit 1 Contact Information**: provides a list of contact information for personnel involved in the OU1 RA and O&M, including EPA personnel, Montana Department of Environmental Quality (DEQ) personnel, and RA contractor personnel.
- **Appendix A - Cost Summary**: provides a more detailed breakout of incurred costs reported in Section 8.
- **Appendix B - RA Construction As-Builts**: provides RA as-built drawings.
- **Appendix C - Analytical Results:** provides summary tables for confirmation soil results and personal and perimeter air sample results.
- **Appendix D - RA Construction Documents**: provides documentation of RA construction including Quality Assurance Reports (QARs), and soil compaction results
- **Appendix E - Change / Modification Logs**: provides documentation of design modifications made during the removal and restoration activities due to unforeseen conditions.
- **Appendix F - Joint Site Inspection Memorandum**: provides documentation of the joint site inspection findings conducted on August 8, 2012.

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Section 2

Operable Unit 1 Background

Investigation and removal activities have been ongoing at the Site in general, and OU1 in specific, since the EPA began its emergency response in 1999. As a result, much of OU1 had already undergone significant remediation by the time the RI/FS was completed. It was determined that the actions consisting of excavation, offsite disposal and engineered cover were adequate to protect human health and the environment. The following sections summarize pre-ROD investigation and removal activities and outline the ROD requirements. For more details on pre-ROD events, refer to the OU1 Final RI Report (EPA 2009a).

2.1 OU1 Historical Investigations and Response Activities

Multiple investigation, pre-removal, and removal events occurred from 1999 until the signing of the OU1 ROD in 2010. The following is a summary of those events by area. For detailed accounts of these events, including sample information and analytical results, refer to the OU1 Final RI Report (EPA 2009a). Confirmation soil sample depths were measured from the bottom of the excavation (i.e., excavation floor is 0 inches below ground surface [bgs]). All other soil sample depths were measured from existing ground surface at the time of sampling.

In general, investigatory soil samples were analyzed using two Libby Site-specific polarized light microscopy (PLM) methods: a visual estimation method (PLM-VE) (Syracuse Research Corporation [SRC] 2003) and a gravimetric method (PLM-Grav) (SRC 2002). Confirmation soil and investigatory bulk material samples were analyzed using the National Institute of Occupational Safety and Health (NIOSH) polarized light microscopy (PLM) method 9002 (NIOSH 1994a). Air samples were analyzed using one or more of the following methods: the NIOSH phase contrast microscopy (PCM) method 7400 (NIOSH 1994b); the transmission electron microscopy (TEM) Asbestos Hazard Emergency Response Act (AHERA) requirements provided in Appendix A to Subpart E of 40 Code of Federal Regulations 763.86. (EPA 1987); and the TEM method International Organization for Standardization (ISO) 10312 (ISO 1995). Dust samples were analyzed using the TEM AHERA method (EPA 1987). In addition, all of these analytical methods employed Libby Site-specific modifications, as were current and approved by the EPA at the time of analysis.

2.1.1 Area 1

- **Investigation Soil Sampling - December 1999.** In December 1999, a total of 80 soil samples (72 samples and 8 field duplicates) were collected from Area 1. Samples were collected as grab samples from the 0- to 2-inch, 0- to 24-inch, or 2- to 12- inch depth interval and analyzed by PLM. Analytical results ranged from non-detect (ND) to 5 percent (%) LA.

- **Investigation Soil and Air Sampling - March/April 2000.** Between March 10 and 11, 2000, 17 grab soil samples and one duplicate were collected from the 0- to 2-inch depth interval, and 16 grab soil samples and five field duplicates from the 2- to 12-inch depth interval. One grab sample was also collected from bags of vermiculite stored outside the warehouse. PLM analytical results ranged from ND to 10% LA.

- In addition to soil sampling, ambient air samples were collected from various locations within the Area 1 boundary on separate days in April 2000 from high-volume stationary air samplers. TEM analytical results indicated LA in ambient air at all three sample locations at concentrations ranging from 0.0001 to 0.0023 structures per cubic centimeter (s/cc).

- **Activity-Based Sampling (ABS) – June 2000.** Two samplers were monitored during the event: one while sweeping the floor of the planar shop's break room; the other while sweeping and moving bags of vermiculite insulation inside the bag house portion of the planar shop. TEM analytical results for the two personal air samples indicated LA in concentrations of 0.6470 s/cc and 2.3666 s/cc for the sweeper and the bag mover, respectively.

- **Area 1 Removal Event – July 2000 through January 2001.** Grace temporarily relocated the onsite business (Millwork West), cleaned five onsite historic buildings and the building's contents, excavated and disposed of vermiculite and LA-contaminated soil and debris, and restored the property. Contaminated materials were disposed of at the former Libby vermiculite mine.

- During soil excavation, 63 confirmation soil samples were collected from the floor of the excavation of which a total of 18 split samples and one duplicate split sample were analyzed. PLM results ranged from ND to 2% LA. Grace, however, was directed to remove additional soil in 4- to 6-inch increments until EPA removal clearance criterion of less than (<) 1% LA was met in each section of the excavation.

- The backfill materials used at Area 1 were obtained from the EPA-approved source Plum Creek pit located in Libby. Restoration at Area 1 consisted of backfilling the entire excavated area with a sufficient layer of common fill to bring the grade to within 6 inches of the original surveyed grade. The final 6 inches were filled with either gravel or topsoil, as appropriate, depending upon the original surface conditions.

- **Area 1 Investigation Sampling – March/April/August 2001.** A total of 15 soil samples were collected at Area 1, as follows:

  - three grab samples were collected from the 0- to 1-inch depth interval near site buildings;

  - five grab samples and one duplicate were collected from the 0- to 6-inch depth interval near site buildings;

  - one grab sample of in-place 1 ½ -inch minus grade fill material (from the Granite pit) from the 0- to 6-inch depth interval;

  - one 3-point composite sample was collected from the 0- to 4-inch depth interval at the site on/off ramp; and

  - one 3-point composite sample was collected from 0- to 4-inch depth interval near the BNSF railroad tracks.

  Four grab samples were collected from the 0- to 4-inch depth interval. Analytical results for LA by PLM ranged from ND to 35% in the soil samples, and ND for LA for the in-place fill material sample.

Thirty-nine bulk material samples (e.g., wood shavings, insulation, debris, etc.) were collected from within the five buildings. Seven samples were collected within the pole barn; seven within the planar shop; six within the scale house/lumber storage building; 13 within the warehouse; and six within the shed. Analytical results by PLM of the bulk material samples ranged from ND to 5% LA.

Two, single-point dust samples were collected; one from a horizontal surface inside the warehouse and the other from the exterior surface of the warehouse foundation. TEM analytical results indicated 169,836 structures per square centimeter (s/cm^2) for LA in dust on the building's foundation, while the indoor sample was ND for LA. Four separate 3-point composite dust samples were collected from horizontal surfaces inside the pole barn, the surface of equipment stored inside the shed, and from the surface of equipment and supplies stored inside each of two site storage containers. Analytical results indicated 129,127 s/cm^2; 97,455 s/cm^2; 19,491 s/cm^2; and 40,200 s/cm^2 for LA, respectively.

- **Area 1 Removal Event – September/October 2001.** Grace conducted a cleanup action to address residual LA contamination in site buildings and soil. Ultimately, four of the five buildings (all but the planar shop) were demolished and additional soil was excavated from the site. The contaminated soil and debris was disposed of at the former Libby vermiculite mine. Confirmation soil samples and dust, for ambient air and personal air, were collected during the removal activities.

  Twenty-three subsurface confirmation soil samples were collected from depths varying between 16 and 50 inches bgs in the former pole barn, former warehouse, former scale house/lumber storage building, former shed, east ball fields, and BNSF spur extending just south of the planar shop. Composite samples of between two and five points were collected. Analytical results were <1% LA by PLM. Thirty-nine additional surface soil samples were collected from suspected of cross-contaminated areas that were previously remediated. These surface samples were 5-point composites from the 0- to 2-inch depth interval. Analytical results were either ND or <1% LA by PLM. In order to evaluate cleanup needs, eight additional soil samples were collected from areas that were not anticipated to have been impacted by removal activities; six were surface samples from 0 to 2 inches bgs, and two were subsurface samples from 8 to 10 inches bgs. PLM results of the surface samples were ND for LA, while the subsurface samples were <1% LA. Consequently, Grace covered impacted areas with a 4-inch layer of crushed gravel. Restoration was conducted with backfill materials obtained from the Plum Creek gravel pit located in Libby.

  One 3-point composite dust sample was collected from the surface of decontaminated lumber moved outside of the exclusion zone. Analytical results were ND for LA. One 3-point composite dust sample was collected from the surface of a lumber pile located inside the exclusion zone. Analytical results indicated LA loading at 365 s/cm^2. Additionally, six 3-point composite dust samples were collected in and around the planar shop. Analytic results for the six samples indicated LA loading of between 609 s/cm^2 and 444,636 s/cm^2. All dust samples were analyzed by TEM.

  Thirty-six personal air monitoring samples were collected during this removal effort. Analytical results for thirty samples, analyzed via TEM ISO 10312, indicated total LA concentrations ranging from ND to 0.0919 s/cc. Thirty-three samples were analyzed via TEM AHERA, indicating total LA concentrations ranging from ND to 0.09290 s/cc. Thirty-two samples were

analyzed via PCM, indicating concentrations ranging from ND to 0.231 fibers per cubic centimeter (f/cc).

- **Area 1 Investigation Sampling – April/May 2002.** Two, 3-point composite soil samples were collected from areas at the site where suspect mine-related material had been identified. Visible vermiculite was observed and believed to be cross-contaminated from BNSF railroad excavation activities. Analytical results indicated both samples contained <1% LA by PLM.

  Two bulk materials samples were collected from the interior of equipment owned and operated by Millwork West. Analytical results from both samples were ND for LA by PLM.

- **Area 1 Removal Event – October through December 2002.** Grace began removing the remaining building material and debris from Area 1. Contaminated soil from the footprint of the demolished planar shop and from an area near the BNSF railroad tracks was also removed. Contaminated soil and building materials were disposed of at the former Libby vermiculite mine. Forty-four, 5- point composite subsurface confirmation soil samples were collected from the floor of the excavations. A total of 36 soil samples were analyzed by PLM, while 8 samples were archived at a project-contracted laboratory. Analytical results were either ND or <1% LA. Restoration was conducted using backfill materials from the Plum Creek pit.

  Ten personal air samples were also collected and analyzed via PCM and analytical results ranged from ND to 0.492 f/cc.

- **Area 1 City Water Line Installation – June through September 2006.** The City began excavating a trench through the field portion of Area 1 in preparation for installing a new drinking water supply pipeline. A total of eight, 5-point composite soil samples were collected from the excavation spoils: four from the stockpiled material in the 0- to 2-inch depth interval and four from the 0- to 2-inch depth interval in the area adjacent to and surrounding the stockpile. Analytical results ranged from ND to 3% LA by PLM. Spoils were removed and transported to the former Libby vermiculite mine for disposal.

- **Other Area 1 Activity.** The City obtained approximately 50 cubic yards of angular riprap rock from the United States Army Corps of Engineers' (USACE's) Fisher River Road pit to cover two areas of exposed orange fencing: one revetment along the Kootenai River bank in between the new and old boat ramps and the other on the surface of the old boat ramp.

- **Area 1 Investigation Sampling – September to November 2007.** Forty-two surface (0 to 6 inches bgs) soil samples (including 3 field duplicates) were collected from Area 1. Samples were collected as 30-point composite samples. Analytical results indicated 29 samples as non-detect and 13 samples with trace amounts of LA by PLM.

  Visible vermiculite observations were made at a total of 1,170 point inspections. Vermiculite was not observed in 1,032 (88.2%) of the point inspections in Area 1. Low levels of vermiculite were observed at 118 (10.1%) of the point inspections; medium levels were observed at 16 (1.4%), of the point inspections; and high levels were observed at 4 (0.3%), of point inspections.

  ABS was conducted in the David Thompson Search and Rescue building. A total of 22 air samples were collected during the indoor ABS activities. TEM analytical results of the active-garage scenario ranged from ND to 0.0699 s/cc; active- meeting room results ranged from 0.0011 s/cc to 0.0088 s/cc; and passive-meeting room results ranged from 0.0003 s/cc to

0.0079 s/cc. Additionally, a total of nine microvacuum dust samples were collected from the building, three each from the meeting room, garage, and rescue vehicles. LA was detected in one sample collected from the meeting room and one sample collected from the garage. The total LA loading for the meeting room and garage dust samples were reported at 75 and 20 s/cm^2, respectively. Samples were analyzed by TEM.

Personal air samples were collected from the workers operating a bush hog. A total of eight personal air samples were collected during this activity. Of the eight samples collected, LA was detected in six samples and concentrations ranged from 0.0038 s/cc to 0.0715 s/cc by TEM.

2.1.2 Area 2

- **Area 2 Investigation Sampling – May/July 2003.** A 2-inch thick layer of vermiculite along the west side of the boat ramp was discovered during construction of a new boat ramp. The layer was approximately 8 to 10 inches below the ground surface. Additional vermiculite containing soil was exposed during renovation of the picnic area. A visual inspection and soil sampling was conducted. Three, 5-point composite soil samples from the 0- to 1-inch depth interval were collected. Analytical results were ND by PLM.

  Two 5-point composites soil samples from the 0- to 6-inch depth interval were subsequently collected. Results for the two samples, which were analyzed by all three PLM methods, ranged from ND to <1% LA.

- **Area 2 Pre-Removal Event – September/October 2003.** Pre-Removal characterization was conducted, which included a verbal interview, site visual inspection, and surface and subsurface soil sample collection. The verbal interview confirmed historical on-site vermiculite storage.

  Vermiculite was observed at several locations within the park: notable amounts were observed on the southwest side embankment and at the bottom of the embankment on the east side of Highway 37.

  Soil sampling activities included both surface and subsurface test pit samples. A total of 19 surface soil samples were collected. All surface samples were either 4- or 5-point composites from the 0- to 6-inch depth interval.

  Twelve test pits were excavated and subsurface sampled. Grab samples were collected at depths ranging from 12 to 39 inches bgs. PLM analytical results indicated that LA was present in nine of the 26 surface soil samples at levels ranging from trace to <1%, and in three of the 18 subsurface soil samples at trace levels.

- **Area 2 Removal Event – October/November 2003.** Within Riverfront Park, soil was excavated to a depth of 12 inches bgs throughout the park area, with the exception of the Kootenai riverbank and the northeast side of City Service Road where soils were excavated to a depth of 6 inches bgs. Excavation of the embankment on the southeast side of City Service Road was not conducted. Additionally, where visible vermiculite was observed or where elevated LA analytical results were detected above EPA's removal clearance criteria, additional 6-inch lifts were removed, iteratively, to a maximum depth of 3 feet bgs. However, along the riverbank and City Service Road embankment, maximum excavation depths were 12 inches bgs.

Fifty-nine, 5-point composite confirmation soil samples were collected at depths ranging from 6 to 36 inches bgs. Analytical results for the samples were either ND or <1% LA by PLM, with the exception of one sample, which was 2% LA, prompting removal of an additional 6-inch layer of soil. Analytical results for the subsequent excavation were <1% LA.

As a visual barrier, orange snow fencing was placed at the excavation floor. The area was restored to original grade using materials from the Boothman Pit and hydroseeded.

A new boat ramp was installed downstream of the existing boat ramp. The removal contractor (RC), Environmental Restoration, obtained riprap from the USACE Fisher River Road pit, which was placed along the toe of the bank.

- **Other Area 2 Activity - July 2007.** Subsurface vermiculite was brought to the surface during the installation of cable by a phone company from a depth of approximately two feet bgs. The excavated soils were disposed of at the former Libby vermiculite mine. The area was covered with four to six inches of rock.

- **Area 2 Investigation Sampling - September 2007.** Nine, 30-point composite surface samples were collected. All analytical results were ND for LA.

  A total of 270 point inspections for visible vermiculite were made. Vermiculite was not observed at 242 (89.6%) of the point inspections. Low levels of vermiculite were observed at 28 (10.4%) of the point inspections.

- **Area 2 Quick Response Removal Event - May 2008.** Soils were excavated to place foundation footings and a full concrete slab in the construction of a new City pavilion. The footings area was excavated to an approximate depth of 57 inches bgs. The excavated soils were disposed of at the former Libby vermiculite mine. The second area was excavated to provide a construction access ramp to the bottom of the City pavilion excavation. Restoration activities were performed by the City using 3 inches of common fill.

- **Area 2 Quick Response Removal Event - July 2008.** Several small areas containing medium to high amounts of vermiculite as well as what appeared to be raw LA were found. The type of vermiculite observed was apparently not from a local source, but was suspected as an import. No vermiculite was observed in these areas after the removal was completed.

2.1.3 Embankments Area 3

- **Area 3 Embankment Investigation Activities - September 2007.** Twenty-two, 30-point composite surface samples from 0-6 inches bgs were collected. Analytical results by PLM indicated 19 samples as ND, two as trace, and l as <1% of LA.

  Fifteen grab soil samples were collected from 0 to 24 inches bgs. PLM LA analytical results ranged from ND to trace and vermiculite was not observed in any of the samples.

  A total of 660 point inspections for visible vermiculite were made. Vermiculite was not observed at 584 (88.5%) of the point inspections. Low levels of vermiculite were observed at 58 (8.8%) of the point inspections; medium levels were observed at 14 (2.1%); and high levels of vermiculite were observed at 4 (0.6%) of the embankment point inspections.

2.1.4 Other OU1 Investigation Activities

- **OU1 Ambient Air Sampling– October 2006-2007 and November/December 2007.** A total of 143 outdoor ambient air samples were collected from four property address locations: 1915 Kootenai River Road, 247 Indian Head Road, Mineral Avenue, and 1427 Highway 37 (J. Neils Park). Analytical results by TEM for LA ranged from ND to 0.00016 s/cc, with an average concentration of 0.00001 s/cc. Thirty-two results were above the average and the remaining 111 results were below the average.

2.2 ROD Requirements

This section describes the RAOs and Selected Remedy for the OU1 site.

2.2.1 Remedial Action Objectives

RAOs are media- and source-specific goals to be achieved through completion of a remedy that is protective of human health and the environment. These objectives are typically expressed in terms of the contaminant, the concentration of the contaminant, and the exposure route and receptor. They provide the basis for determining whether protection of human health and the environment is achieved for the selected remedy. RAOs for OU1 were developed by evaluating several sources of information, including results of the risk assessments conducted as part of the OU1 RI Report (EPA 2009a) and current and future land use of the site.

Based on determinations of human health risks (EPA 2009b), LA in vermiculite and/or soil was likely to pose a current exposure risk to human receptors through inhalation of fibers released during active soil disturbance activities and inhalation of fibers in outdoor (ambient) air. It was expected that any risk from potential future disturbances that would expose subsurface, LA-containing soil might be substantially higher than under the current conditions prior to the RA. Site conditions are such that surface soils have either been capped or else removed and backfilled with clean soil as per the established removal clearance criteria for the RA.

The current and anticipated future land uses for the site were an important consideration for the development of RAOs to ensure remedial alternatives are protective of human health and the environment. Area 1 is owned by the City and a City park development is proposed for the majority of this area. Area 2 (Riverfront Park) is also owned by the City and used by the public. Area 3 consists of Highway 37 and City Service Road eastbound embankments, maintained by the MDT and the City, respectively, with no known current plans to disturb the in-place soils. The northwest corner of the site is currently occupied by the David Thompson Search and Rescue building.

The RAOs for the site presented below were based on anticipated future recreational, commercial, and/or light industrial use of the site:

1. Break the exposure pathways for inhalation of LA fibers that would result in unacceptable cancer risk or non-cancer hazard.

2. Control erosion of contaminated soil by wind and water from source locations to prevent exposures and the spread of contamination to unimpacted locations.

3. Implement controls to prevent uses of the site that could pose unacceptable risks to human health or the environment or compromise the remedy.

At a typical site, RA is required when contamination poses cancer risks that exceed 1 in 10,000 (or 1E-04) (EPA 2010). The RAOs for OU1 addressed LA contamination that poses cancer risks in the ranges between 1 in 10,000 and 1 in 1,000,000 (1E-06). Remedial goals (RGs) are typically used to guide such RA. RGs are defined as the average concentration of a chemical or a contaminant in an exposure unit associated with a target risk level such that concentrations at or below the RG do not pose an unacceptable risk. However, RGs were not developed for OU1, or the remainder of the Site (EPA 2010).

RGs are typically developed by computing the concentration of a contaminant in soil that corresponds to an excess cancer risk of 1E-04. However, such a computation is not possible at present because of the high variability in the relationship between asbestos in soil and asbestos in air. Even if the computations were possible, the ability to measure asbestos in surface and subsurface soil is presently limited by the available technologies and methods (EPA 2010). Additionally, noncancer risks from inhalation of asbestos fibers have also been recognized, but there is no current methodology to quantify noncancer risks for asbestos (EPA 2009b).

For these reasons, RGs for asbestos were not established for site soils. If the RAOs for asbestos contamination are achieved through implementation of the Selected Remedy, then risks to humans from inhalation exposures to asbestos are expected to be acceptable (EPA 2010).

2.2.2 Selected Remedy

As presented in the ROD for OU1 (EPA 2010), the Selected Remedy for remediation of asbestos-contaminated soil is a combination of Alternative 3b (In-Place Containment of Contaminated Soil, Removal of Contaminated Soil for Utility Corridors, Offsite Disposal, and ICs with Monitoring) and Alternative 4a (Partial Removal of Contaminated Soil, Offsite Disposal, and ICs with Monitoring). These removal and containment remedies will achieve all RAOs by eliminating current exposure pathways and monitoring to ensure that the remedy continues to protect human health and the environment. A summary of the Selected Remedies, as detailed in the ROD, is as follows:

- The majority of the remediation work will consist of containment via construction of soil covers to encapsulate areas of surface contamination. The FS anticipated that approximately nine acres of the site would be covered.
- Removal and offsite disposal of contaminated materials will be used in the proposed utility corridor areas. Flexibility to remove other areas of contamination is included to preemptively remove contaminated materials as land use issues develop.
- A visible marker layer will be placed at the bottom of the cover to denote the extent of the cleanup.
- Clean fill for excavations and construction of covers will be obtained from offsite subsoil and topsoil sources outside of the Libby valley. Final quantities will be evaluated in the design process.
- Removal and offsite disposal of contaminated materials will be used in the proposed utility corridor areas which are expected to encompass approximately 10 percent of Areas 1 and 2. Additionally, by adding Alternative 4a to the selected remedy, EPA obtains the flexibility to remove other areas of contamination that may need to be removed preemptively due to land use issues.

- Employ ICs to minimize risks posed to human receptors from remaining LA in subsurface soil by limiting uses that might create an exposure pathway or damage the remedy. EPA anticipates that ICs for OU1 will include governmental and/or proprietary land use restrictions, and informational devices. Governmental ICs, for example, may impose land or resource restrictions using government authority, such as building codes, permits, or zoning regulations that are administered by local agencies. Proprietary controls, either private, governmental, or a combination of the two, typically involve landowner agreements or easements that restrict certain activities on the property. ICs are considered an integral part of the remedy, so development and implementation of the ICs will be conducted as part of the remedial action.
- If needed, install engineered controls to warn the public and limit access to the site.
- Maintain the integrity of the selected remedy and monitor the remedy to ensure that the controls are effective.

Points of clarification presented in Section 14, Documentation of Significant Changes of the ROD are regarded as subcriteria for determining whether the remedy put in-place at OU1 meets the criteria for determination of operational and functional (O&F). The following is a summary of the points of clarification and the manner in which the EPA will address them:

- **Risk Assessment.** The EPA will conduct a quantitative, OU1 post-construction risk assessment, to include ABS, at OU1 following the completion of construction to confirm effectiveness of the remedy (EPA 2010). It is anticipated that risk assessment sampling activities will be conducted in summer 2013.
- **New Information.** When the site-wide risk assessment is complete, the agencies will re-evaluate the remedy in accordance with the review requirements at CERCLA Section 121(c). New information concerning toxicity factors will also be evaluated in five-year reviews. If unacceptable exposures are identified, the EPA will take action as necessary to ensure that the soil-to-air pathway is broken. Actions may include additional excavation, improving covers, and/or strengthening ICs. In addition, the EPA will conduct five-year reviews as part of the ongoing O&M of the remedy.
- **Planned Future Uses.** The EPA will work closely with the City during design so that design can complement any planned future uses.
- **Removal of Contamination at Depth in Excavations.** Encountered LA source materials during excavation activities will be removed to a maximum of 3 feet below finished grade. A visible barrier marking the extent of excavation will be placed at the bottom of the excavation before backfilling.

The implementation of the Selected Remedies is detailed in Sections 3 and 6.3 of this report. An evaluation of the performance of the Selected Remedies in terms of satisfying the RAOs is presented in Section 5.1.

2.3 Remedial Design

Subsequent to the ROD completion and preceding construction, the City retained a designer to develop the proposed park. RA design drawings (EPA 2011b) were prepared in response to the City's proposed design for this RA. Construction activities at the site were conducted in accordance with the Libby Site Response Action Work Plan (RAWP) (USACE 2010a), and the design drawings. OU1 remediation plans were prepared to supplement the RAWP and address OU1 site-specific remediation. During construction, modifications were made to these site-specific RAWP, as documented in Section 3 and the as-built drawings provided in Appendix B.

Section 3
Construction Activities

RA construction activities were conducted in accordance with the RAWP (USACE 2010) and design drawings (EPA 2011b). Construction activities included:

- Mobilization and Site Preparation;
- Excavation and Disposal of Contaminated Soil;
- Riverbank revetment;
- Boat ramp restoration;
- Backfill; and
- Erosion and stormwater control.

The following is a brief description of RA construction activities from mobilization through demobilization. RA construction as-builts and construction-related documents are provided in Appendices B and C.

3.1 Mobilization and Site Preparation

The mobilization and site preparation for this RA commenced on August 9, 2011 and followed the same progression as previous removal activities at the site. The necessary equipment including, but not limited to, a decontamination trailer, excavator, and potable and non-potable water tanks were mobilized to the site. The RC, PRI-ER, delineated the removal areas by removing the existing safety fence and replacing it with new orange fencing and yellow caution tape. The site was cleared of ground-cover vegetation to facilitate the surveying crew. U-Dig, the utility locate service, was contacted and utilities were marked within the work zone prior to excavation. Any hazards existing within the work zone were isolated or removed. RC and third-party quality assurance (TQA) personnel, CDM Smith, walked through the site during this set-up to ensure that each contractor had current copies of remediation designs (Appendix B) and concurred on project design objectives. Following this inspection, asbestos tape was added to the orange construction fencing to establish the removal areas as an exclusion zone. The RC collected pre-excavation photos to document current site conditions when the RC took control of the site.

3.2 Removal Activities

One of the main construction components of the RA was the excavation and offsite disposal of contaminated soil. OU1 is unique compared to the other Libby OUs in that finish grade was not pre-existing. The City proposed City park development for OU1. The City contracted with a designer, WGM Group, who provided site finish grades. These grades were used to determine depth of excavation across the site, based on a minimum 18 inch cover of import soil over native soils containing <1% LA. An additional 18 inches of soil was excavated for those areas with analytical results greater than or equal to (≥) 1% LA. The excavation area would be resampled and analyzed for informational purposes, i.e. soils with elevated concentrations ≥1% LA would have a minimum 36 inches cover of import soil.

Furthermore, an orange construction barrier was placed on the subgrade surface prior to import soil placement. The marker barrier was installed as a visual means of identifying the interface between native and import soils.

A comprehensive excavation plan was created and represented in the field using a 25 feet on-center alpha-numeric grid system. Each grid intersecting point had a construction stake with elevation information that the excavation operators and soil sample technician could spatially reference on the plans.

A total of 25,656 cubic yards (cy) of contaminated soil was removed from OU1 and disposed of at the former vermiculite mine. Volume of soil removed was not tracked separately by area because areas were excavated concurrently. Specific removal activities by area are described in the following subsections.

3.2.1 Excavation of Contaminated Soil

3.2.1.1 Area 1

Site preparation activities began August 17, 2011 with removal of existing railroad structures, a loading ramp and railroading siding, which were contained within the exclusion zone. Prior to intrusive excavation, these structures were removed, decontaminated, and staged for the City's off-haul by the RC.

Site removal activities began on September 30, 2011. Excavation began east of and at the northeast corner of the David Thompson Search and Rescue parking area and adjacent to the south edge of pavement of City Service Road and proceeded east. Two additional excavation crews began south of and adjacent to the first excavation crew, working in an easterly direction. When each excavation crew completed excavation to final depth and to the easterly limits of construction, the crews would relocate to the westerly limits of excavation south of the just completed section and begin excavating anew in the same manner. This facilitated disposal trucks access to the site and to the excavation crews traveling on imported laydown soil, mitigating cross-contamination.

Area 1 excavation activities were completed for the 2011 construction season on October 24, 2011 at the southeast corner of the site. On October 29, 2011, excavation activities were completed at the proposed detention basin for future stormwater control. No further intrusive work was conducted for the remainder of 2011.

A cooperative agreement was reached between the City and the EPA for a new City sanitary sewer line where City employees would construct the entire system and the RC would only be responsible for transportation related activities, disposal of excavation spoils at the mine, and the final 12-inch trench backfill section. Sanitary sewer trench construction began May 10, 2012 at the existing sanitary sewer manhole north of and adjacent to the northwest corner of the David Thompson Search and Rescue building and progressed 356 feet to the southeast and 338 feet to the southwest. The new sanitary sewer system was completed May 30, 2012.

On June 8, 2012, removal activities reconvened with the final excavation of Area 1 at City Service Road. In accordance with the design drawings; City Service Road asphaltic concrete (AC) removal was staged where the westbound lane was first removed in order to maintain one-way traffic on the eastbound lane. AC removal began adjacent to the David Thompson Search and Rescue building and progressed east. When the westbound AC was removed, the same process was employed for the eastbound lane. AC removal was completed on June 12, 2012 and the roadway base section excavation

began at the easterly limits on June 13, 2012. The roadway base section excavation was completed on June 15, 2012. The roadway was realigned and replaced with crushed rock as discussed in Section 3.3.

3.2.1.2 Area 2

On February 28, 2012 the RC mobilized to the site to begin work in Area 2 to reinforce the existing deteriorated revetment along the south river bank of the Kootenai River, beginning just east of the gravel boat ramp and extending just west of the concrete boat ramp. Clearing and grubbing preceded rip rap placement. Rip rap placement followed the proposed design with D85-D100 sized rock submerged to establish the toe of slope within the river bottom, where D85 and D100 are the rock sizes that correspond to 85% and 100% of the sample passing by weight. Following the toe of slope establishment, USACE Class V rock was placed on the embankment toe and continued upslope to the top of the embankment. A total of 3,850 tons of rock were placed as part of the revetment. Revetment placement was completed March 13, 2012, though some minor hand work continued the following day to chink voids and ensure three-point contact on unstable rocks.

Subsequent to the revetment construction, the new Armorflex™ mat boat ramp construction began May 30, 2012 with the excavation at the existing concrete ramp's toe of slope. A Portland cement concrete pad was placed in advance of the proposed boat ramp surface which was completed June 12, 2012. Work resumed at the boat ramp on June 18, 2012 to install the Armorflex™ mat. The Portland cement concrete anchors for the boat ramp were poured on June 19, 2012 and surrounding area along the embankment was dressed with rip rap which was completed August 10, 2012.

3.2.1.3 Area 3

The RC began excavation at Area 3 concurrent with the Search and Rescue parking area excavation, at Highway 37 west embankment on August 18 and completed August 25, 2011. The embankment soil was excavated to a depth of approximately 6 inches bgs. On August 19, 2011 the RC began the 6-inch excavation of the City Service Road south embankment in Area 3. Uniform removal of contaminated soil to approximately 6 inches bgs was excavated in the two discrete locations of Area 3 on both east and west embankments of Highway 37, north of City Service Road. Excavation began on April 19, 2012 at the east embankment followed by the west embankment which was completed on April 26, 2012.

3.2.2 Offsite Disposal of Contaminated Soil

As specified in the Selected Remedy, the contaminated soils were excavated and hauled to the former vermiculite mine for offsite disposal. All haul trucks and trailers working on the Libby project were required to have water-tight beds. These sealed beds allowed water conditioned soil, for the purpose of fugitive dust mitigation, to be placed in the bed of the dump truck without leaking contamination. In addition, all trucks and trailers used tarps secured over the top of the bed to mitigate fugitive dust during transport. To prevent contamination of the interior of the truck, a negative air system maintained positive pressure in the cab of the truck while in excavation areas and traveling on the mine road. These trucks and trailers delivered material to an area along the mine road called the amphitheater and then underwent a thorough decontamination before leaving the mine. Soil was taken from the amphitheater by mine-designated vehicles to areas farther up the mine road for disposal.

3.2.3 Confirmation Soil Sampling

Confirmation composite soil samples were collected from the bottom of discrete excavated areas, in sizes no larger than 2,500 square feet by combining the 25-foot excavation grid system into 50-foot cells. These samples were collected, handled, and analyzed in accordance with the Response Action Sampling and Analysis Plan (EPA 2011c). The sample depths for confirmation soil samples were measured from original ground surface to the excavation floor. Sample depths typically ranged from 18 to 36 inches bgs across the site.

A total of 241 confirmation soil samples were collected and analyzed throughout the duration of the RA. Samples were 30-point composites and were generally collected from the 18 to 20-inch depth interval. A 30-point inspection for visible vermiculite was also performed in each sampled area to ensure clearance removal protocols were achieved. The analytical results for these samples ranged from ND to 5% LA by the NIOSH PLM 9002 method (NIOSH 1994a). A total of eight out of the 241 samples had results ≥1% LA. Figures 3-1 through 3-4 show the confirmation sample areas beneath the engineered cover at which residual contamination may be encountered across OU1. Sample results are provided in Appendix C.

3.3 Backfill, Compaction and Placement of Cover

All backfill materials were sourced from borrow areas at Ward Pit, Noble Pit, Nickelback Pit, USACE Fisher River Rip Rap Pit, Wolf Creek Rip Rap Pit, Libby City/County Pit, Granite Pit and Chapman Pit outside of the Libby valley and were tested prior to placement. As detailed in the RAWP (USACE 2010a), backfill materials were tested to ensure that they are both within specifications for the respective fill type and that they were not contaminated with LA.

Per the RAWP and design drawings, a visible marker layer was placed at the bottom of the excavation prior to backfill. Orange construction fence was placed directly upon the finished subgrade prior to placing import soils.

The project comprised of six typical cross sections with varied soil types and thicknesses depending on the areas' designed uses. The sections ranged from structural road section to landscaping. Soil was nominally placed in 8-inch lifts and dynamically compacted to the designed relative compaction specification and elevation. Three types of import soil were used for cover material; common fill (7,377 cy), ¾-inch-minus crushed base (6,581 cy), and top soil (4,024 cy). The City Service Road was realigned and replaced with a minimum 8-inch thick sub-base using 3-inch minus crushed rock, followed by a 10-inch layer of ¾-inch minus sub-base coarse. Details of the cross sections are shown in the OU1 as-built drawings provided in Appendix B.

Restoration activities began with the placement of the visual barrier on October 4, 2011. Import soil placement and compaction began on October 7, 2011 and the visual barrier placement advanced ahead of soil placement across the site. Site soil cover placement was completed on June 29, 2012.

3.4 Erosion and Stormwater Control

All excavated areas were either hydroseeded (272,592 ft^2) by a landscape contractor or received a structural base material (167,328 ft^2) to stabilize the surface soils from erosion. Erosion matting (35,856 ft^2) was also placed on the embankment areas that were excavated. Structural base material placement was staged as part of the import soil placement, hydroseeding, and tree planting which was completed on June 29, 2012. Drainage features were also incorporated into the design in the form of

swales discharging into trench drains and sumps to manage stormwater runoff. These measures will help to ensure that the Selected Remedy remains protective of human health and the environment. Ongoing O&M includes routine visual inspections of the erosion control materials and communication with the City on work in and around OU1.

Construction as-builts for OU1 are presented in Appendix B.

3.5 Demobilization

Equipment used during construction activities was decontaminated, as necessary, and demobilized from the site as soon as that particular piece of equipment was no longer needed. As a result, demobilization from OU1 occurred throughout RA construction activities. The final demobilization date was June 29, 2012, as documented in the QAR in Appendix D.

3.6 Design Modifications During Construction

During the removal and restoration activities, unforeseen conditions were encountered and design revisions were made. Consequently, forty design modifications were made over the course of the project. Design modifications were executed by the RC in real time with no delay impact to the project. Some of the major modifications are as follows:

- Mod #6: increased the thickness of the road-base materials from 6 inches of ¾-inch minus base to 10 inches of ¾-inch minus crushed base course;
- Mod #18: as indicated on the as-builts, marker barrier was placed in limited areas of the David Thompson Search and Rescue parking area in accordance with an earlier revision of the design documents;
- Mod #19 and #21: modified the excavation depths to avoid damage to shallow utilities;
- Mod #24: replaced 8 inches of common fill with 6 inches of topsoil on embankments; and
- Mod #40: Enlarged two rock trench drains along western boundary of Area 1.

The Change / Modification log and copies of the modifications are found in Appendix E.

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Section 4
Chronology of Events

This section presents a tabular summary that lists the major events for the Site OU1 RA project and associated dates of these events beginning with the ROD signature. See Section 2.1 for a summary of all investigation and removal activities that occurred prior to the ROD.

Date	Event
May 10, 2010	ROD for OU1 Signed
August, 2011	Remedial Design Complete
August 9, 2011	Mobilization and Site Preparation
August 16, 2011	Start of Excavation
March 13, 2012	Area 2 River Bank Revetment Complete
April 26, 2012	Area 3 Remedial Excavation Complete
June 15, 2012	Area 1 Remedial Excavation Complete
June 29, 2012	Area 1 Remedial Restoration Complete
June 29, 2012	Area 3 Remedial Restoration Complete
August 8, 2012	Joint Site Inspection
August 10, 2012	Area 2 Boat Ramp Restoration Complete
August 10, 2012	Final Restoration Inspection
October 3, 2012	Construction As-Builts Submitted to City
TBD	O&M Plan Approval
Summer 2013	OU1 Post-Construction Risk Assessment Sampling
TBD (estimated Summer 2014)	First Annual Site Inspection
TBD	Institutional Control Implementation and Assurance Plan (ICIAP) Approval
TBD	OU1 Post-Construction Risk Assessment Report
TBD	Site-wide Risk Assessment Report
TBD	O&F Determination/Start of O&M Phase
TBD	First Annual O&M Site Inspection
TBD	First Annual O&M Report
TBD	First Five-Year Review

TBD – to be determined

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Section 5

Performance Standards and Construction Quality Control

This section describes the overall performance of the removal and containment remedy in terms of comparison to the OU1 site remedial action objectives. In addition, this section discusses the remedy performance monitoring strategy and QA/QC procedures followed.

5.1 Comparison to RAOs

The RAOs for the OU1 site are presented in Section 2.2.1. This section presents a brief summary of the current conditions as compared to the RAOs. Upon completion of the OU1 post-construction risk assessment, the EPA will verify that all RAOs are still met.

The confirmation soil sample analytical results from the removal activities indicate that the majority of the site's exposed finish subgrade is at concentrations <1% LA. Figure 3-1 shows the concentrations and depths of LA remaining across all of OU1. In the areas with residual contamination, the in-place cover is sufficient to break the exposure pathway. This accomplishes the RAO of mitigating the potential for inhalation exposure to asbestos fibers that would result in risks that exceed the target cancer risk range of 1E-06 to 1E-04. However, the EPA will conduct a post-construction risk assessment at OU1.

Restoration activities at OU1 included placement of cover and seeding or re-vegetation, and in some cases, placement of rip-rap and/or erosion control matting. These measures address the second RAO to control erosion of contaminated soil by wind and water from source locations to prevent the spread of contamination to unimpacted locations. Section 7 provides a brief description of OU1 O&M measures in place to ensure that the Selected Remedy remains protective of human health and the environment.

The final RAO to implement controls to prevent uses of the site that could pose unacceptable risks to human health or the environment or compromise the remedy will be addressed by the implementation of ICs for OU1. An Institutional Control Implementation and Assurance Plan (ICIAP) will be developed to address implementation and periodic review of the specific IC instruments for OU1. This is discussed further in Section 6.3.

5.2 Remedy Performance Monitoring Strategy

The ROD included monitoring as a component of the Selected Remedy to ensure long-term effectiveness and permanence. The remedy performance monitoring strategy includes inspections and reviews (EPA 2011c). During the site inspections, current site conditions — including drainage, signs of erosion and integrity of the cover — will be observed and documented. Monitoring of the ICs will include evaluations of the effectiveness of the ICs implemented by the ICIAP. Section 7 provides a brief description of OU1 O&M measures in place to ensure that the Selected Remedy remains protective of human health and the environment.

Five-year site reviews will be conducted by the EPA (as required by the National Oil and Hazardous Substances Pollution Contingency Plan due to contamination left-in-place) to ensure that the remedy as implemented and maintained continues to be protective of human health and the environment.

5.3 Construction QA/QC

During RA construction, TQA personnel were tasked with documenting if construction activities were performed in accordance with the RAWP and design drawings. TQA personnel recorded observations on a daily basis in the QARs. Deviations from the guidance documents were recorded in the Change / Modification log discussed in Section 3.6. Upon completion of construction activities, the restoration final inspection (RFI) was conducted. TQA and RC staff walked through the site on August 10, 2012 to determine if the scope had been completed in a satisfactory manner. This inspection, which did not identify any deficiencies, was noted in the QAR provided in Appendix D.

A joint site inspection (JSI) by the EPA, DEQ, RC, and TQA representatives also occurred on August 8, 2012. A detailed account of these QA/QC assessments is presented in Section 6.1.

5.4 QA/QC Procedures

QA/QC measures for this remedial action included, but were not limited to, appropriate training of sampling and inspection personnel, the collection of field QC samples (such as duplicate soil samples and field blanks), implementation of a laboratory QA program (implemented for the entire Site), review of this report by an approved CDM Smith QA staff member, and audits to evaluate adherence to project requirements and procedures outlined in relevant site guidance documents.

Section 6

Final Inspections and Certifications

6.1 Remedial Action Contract Inspections

This section provides a description of all contract inspections, including field audits, the RFI and the JSI.

6.1.1 Field Audits

Daily field audits, or follow-on inspections, were performed by the TQA. The RAWP (USACE 2010a) required that these inspections be conducted at least once per day at each work site for each phase of work. Work practices, compliance with plans and specifications, compliance with safety, and efficiency were reviewed and recorded on the daily QAR. Any deficiencies noted were immediately communicated to the task foreman for resolution.

All RA construction activities were conducted in accordance with the RAWP and design drawings. No major deficiencies were identified during the daily audits. All QARs for the remedial action are provided in Appendix B.

6.1.2 Restoration Final Inspection

The Restoration Final Inspection was conducted on August 10, 2012 following the completion of restoration activities (with the exception of hydroseeding near the boat ramps, which was not completed until August 14, 2012.) This inspection provided an opportunity for the City, RC, and TQA to meet onsite and identify any non-conformance with the work plan. In this case, no deficiencies were identified by the City, RC, or TQA. This RA was completed in accordance with the RAWP and design drawings.

6.1.3 Joint Site Inspection

Representatives from the EPA, DEQ, RC, and TQA met at the site on August 8, 2012 to conduct a JSI. The results of this inspection were reported in the OU1 JSI Memorandum (CDM Smith 2012). This type of inspection is typically conducted at the conclusion of construction at a given site and is required before an O&F determination can be made.

During the JSI, attendees observed current site conditions and reviewed previous remediation/restoration activities. Attendees agreed that construction activities were completed in accordance with the Selected Remedy outlined in the OU1 ROD, RAWP and design drawings. However, due to the current lack of toxicity data for LA, an O&F determination was not made and, as agreed by JSI attendees, will be deferred until the OU1 post-construction risk assessment sampling is completed. A copy of the JSI Memorandum is provided in Appendix F.

6.2 Health and Safety

All activities conducted at the Site are subject to conformance with the Comprehensive Site Health and Safety Plan (CHASP) (CDM Smith 2011). Included below is a brief description of significant health and safety measures implemented during the RA. For details, reference the CHASP.

During construction, water-based dust suppression was used to prevent asbestos fibers from becoming airborne. This alleviates cross-contamination concerns by preventing offsite migration of fibers. Also, dust suppression provides additional respiratory protection for laborers working within the contaminated areas. To prevent migration of fibers during transport, containerized truck beds and trailers are used.

During the RA, all personnel on site used proper personal protective equipment (PPE), as documented in the QARs. A minimum of modified level D was worn on the site at all times, including safety shoes, safety glasses, and hardhats. Personnel entering the exclusion zone wore modified level C, including safety shoes, safety glasses, disposable coveralls, hardhats, and half or full face respirators (depending on intrusiveness of activity). Personnel exiting the exclusion zone went through a thorough decontamination process in the shower trailer located in the contamination reduction zone. Additionally, the clean room of the decontamination shower trailer was regularly monitored for potential LA fiber migration, with all 12 ambient air samples ND for LA by TEM (see Appendix C).

Perimeter air samples were collected from the downwind side of excavation areas during all removal activities to monitor for offsite migration of LA. All of these air samples were ND for LA by TEM. Results of the perimeter air samples are included in Appendix C. The CHASP also requires bi-annual personal air monitoring for operators and laborers performing removal activities; however, this is a site-wide requirement that was also satisfied at other locations on the Site. For the 13 personal air monitoring samples collected for OU1 site workers during RA activities, PCM results indicate levels within OSHA permissible exposure limits (see Appendix C).

6.3 Institutional Controls

ICs are non-engineering measures designed to prevent or limit exposure to hazardous substances left in place at a site, or assure effectiveness of the chosen remedy. ICs currently in-place at OU1 include:

1. One Call Locate Center – Any excavation requires a call to Montana's One-Call underground facility location service (U-Dig) for Lincoln County to identify the potential for buried facilities. For an excavation within the Superfund Site boundary, a call to U-Dig also prompts the Environmental Resource Specialist (ERS) program to identify the potential for residual asbestos contamination on the property.

2. Permit - Any excavation within the MDT right of way requires a permit from MDT. That permit includes information about the potential to encounter asbestos contaminated soil.

The EPA is also evaluating further proprietary/legal controls for each portion of the OU. All final ICs for OU1 will be compiled in the ICIAP.

Once established, the ICs will be evaluated and updated on an annual basis by DEQ. DEQ will conduct this work under the Cooperative Agreement, if amended, and following entry into the O&M period. The evaluation will assess whether the selected IC instruments remain in place and whether the ICs are enforced such that they meet the stated objectives and performance goals and provide protection

required by the response. Five-year site reviews performed by the EPA will also periodically evaluate the effectiveness of the ICs as they are implemented and maintained.

The following are the IC categories. For more information on these ICs, refer to the ICIAP (EPA 2012a). The ICIAP identifies the specific IC instruments implemented for the Selected Remedy.

- **Proprietary Controls** - Proprietary controls have their basis in real property law and generally create legal property interests (EPA 2000a). Potential IC instruments considered for this remedial action in the OU1 ROD include an environmental covenant, easement, or deed notice.
- **Governmental Controls** – Government controls impose restrictions on land use or resource use, using the authority of a government entity (EPA 2000a). All future land use is anticipated to be residential and/or commercial.
- **Informational Devices** – Informational devices could provide information or notification to local communities that residual or contained contamination remains on site (EPA 2000a). The EPA anticipates that an important component of the informational devices will be an agreement with the utility-locate service, U-Dig, to add areas of subsurface contamination to their database of underground hazards.
- **Enforcement and Permit Tools** – Enforcement and permit tools are legal tools, such as administrative orders, permits, Federal Facility Agreements (FFAs) and Consent Decrees (CDs), that limit certain site activities or require the performance of specific activities (EPA 2000a). The establishment of enforcement and permit tools is not anticipated at the time of the development of this report.

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Section 7

Operation and Maintenance Activities

This section summarizes the general activities for post-construction operation and maintenance. This section also summarizes re-evaluations that will ensure that the Selected Remedy remains protective taking into account future risk assessment data. Detailed information regarding operation and maintenance for the OU1 site is provided in the Draft O&M Plan (EPA 2013).

7.1 Long-Term O&M Activities

Long-term O&M will be performed to maintain the integrity of the remedy components, including protective covers and ICs, after OU1 is determined to be operational and functional. The O&M Plan will define the responsibilities for long-term O&M of the remedy and repairs. The following subsections summarize what will be considered routine O&M activities.

7.1.1 Routine Site Inspections

Routine non-intrusive visual site inspections will be conducted to ensure integrity of the covers and backfilled areas. OU1 site inspections are assumed to be performed at least annually as well as concurrently with the five-year site review.

7.1.2 Cover Maintenance

The main concern during the O&M period will be future encounters with contaminated soil resulting from damage to the remedy. Damage to covers and backfilled areas identified during routine OU1 site inspections will be repaired to eliminate exposure of underlying contamination. Issues that may arise with the covers during long-term O&M and contingency plans for such occurrences are detailed in the Draft O&M Plan.

7.1.3 U-Dig Review

U-Dig call data will be evaluated for accuracy and validity as calls are received to ensure protectiveness. Evaluation of U-Dig calls is discussed in the OU1 O&M Plan.

7.1.4 IC Evaluation and Updates

ICs will be evaluated on at least an annual basis and updated if necessary to ensure protectiveness. Evaluation and updates for different types of ICs are discussed in the OU1 O&M Plan.

7.1.5 Reporting

Routine reports summarizing O&M activities will be prepared by the DEQ and submitted to the EPA on an annual basis. Routine reporting also involves regular review and updates as necessary to the O&M Health and Safety Plan (HASP). Reporting requirements are discussed in the OU1 O&M Plan.

7.2 Five-Year Reviews

Five-year site reviews of the OU1 site will be performed since contaminated subsurface soil is left in place below the protective covers and backfilled excavations, preventing unrestricted use of the OU1 site. The EPA is responsible for performing and funding the five-year reviews as long as they are required.

The five-year review process consists of six components: 1) community involvement and notification; 2) document review; 3) data review and analysis; 4) site inspection; 5) interviews; and 6) protectiveness determination (EPA 2001), (EPA 2003).

- Community involvement activities will notify the public that the five-year review will be conducted, that it has been completed, and that results are available for review at the EPA Information Center in Libby.
- Document review involves an evaluation of all relevant documents and data to obtain information to assess the performance of the remedial action.
- Site inspections will be conducted to gather information about the site's current status and to visually confirm and document the conditions of the remedy, the site and the surrounding area.
- Interviews may be conducted as necessary with the site manager, site personnel and people who live or work near the site to gather additional information about the site's status or to identify remedy issues.
- The protectiveness determination should include a technical assessment of the following questions:
  - Is the remedy functioning as intended by the decision documents?
  - Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?
  - Has any other information come to light that could call into question the protectiveness of the remedy?

7.3 OU1 Post-Construction Risk Assessment Re-Evaluation

When the OU1 post-construction risk assessment is complete, the EPA will re-evaluate the remedy to confirm its effectiveness. If unacceptable exposures are identified, the EPA will take action as necessary to ensure that the soil-to-air pathway is broken. Actions may include additional excavation (to a maximum of 3 feet), improving covers, and/or strengthening ICs. If contamination continues below 3 feet, a visible barrier marking the extent of excavation will be placed before backfilling.

Section 8

Summary of Project Costs

Consistent with EPA guidance (EPA 2000a), a summary of project costs is provided within this RA report. According to the guidance, the total project costs are to be compared to the estimates presented within the ROD. It should be noted that this section provides project costs for the 2011/2012 remedial action only. The costs associated with previous removal actions are not considered because those removal actions were conducted under Comprehensive Environmental Response, Compensation, and Liability Act removal authority rather than remedial authority.

All capital costs in the comparison table below are reported in the same dollar basis as the actual project costs (i.e., 2012 dollars). The capital costs projected in the ROD were escalated to 2012 dollars using the USACE Civil Works Construction Cost Index System (USACE 2012). Because O&M costs have not been incurred and will not be compared, the ROD projections for annual O&M costs and periodic costs remain in 2010 dollars. Appendix A provides a summary of actual capital costs associated with construction activities (earthwork).

	Projections in ROD	Actual Costs
Capital Cost (ICs and Engineered Controls)	$61,000	Not yet incurred
Capital Cost (Earthwork)*	$3,467,000	$2,813,190
Annual O&M Cost and Periodic Cost (Five-Year Reviews)	$955,000	Not yet incurred

*ROD projections escalated to 2012 base year

The incurred total capital costs associated with the RA were less than projected in the ROD. In large part the reduction in cost is due to cost savings in technical support which included remedial design, project management, and construction management. The cost estimate for the preferred alternative assumed approximately $880,000 (escalated to 2012 base year) for technical support. The technical support costs for the preferred alternative were based on EPA guidance for estimating indirect costs (EPA 2000b) using percentages applied to the total estimated construction costs. As shown in Appendix A, only $383,025 was spent on technical support. However, the actual technical support costs do not include costs incurred by the EPA and USACE.

Below is a summary of probable costs of O&M. The actual cost to the stakeholders (i.e. DEQ and/or EPA) may be lower depending on whether the State can find cost efficiencies in implementing the O&M at OU1 of the Libby Asbestos site. Costs related to implementation of ICs are excluded from the O&M cost estimate.

The detailed cost estimate (cost worksheets, cost summary, and present value analysis) is presented in Appendix B of the OU1 O&M Plan (EPA 2013). The following table presents the summary of the O&M cost estimates.

Table 8-1 Summary of Probable Operations and Maintenance Cost Incurred by City of Libby

O&M Component	Cost Type	Description	Cost
Pavement Maintenance (Minor Repairs)	Periodic O&M Cost	Includes general maintenance every five years for filling pavement cracks.	$14,000
Pavement Maintenance (Resurfacing)	Periodic O&M Cost	Includes scarifying, resurfacing, and disposal of asphalt every five years.	$198,000
Pavement Maintenance (Replacement)	Periodic O&M Cost	Includes complete removal, replacement, and disposal of asphalt and base course every twenty years.	$437,000
		Total Probable Cost Over 30 Years	**$1,511,000**

Note:

1. Detailed costs and backup are presented in Appendix B of the OU1 O&M Plan (EPA 2013).
2. Costs are rounded to the nearest $1,000.
3. Costs based on 2013 prices.
4. Costs presented are expected to have accuracy between -30% to +50% of actual cost, based on the scope presented.

Table 8-2 Summary of Probable Operations and Maintenance Cost Incurred by DEQ

O&M Component	Cost Type	Description	Cost
Routine Site Inspection	Annual O&M Cost	Includes annual site inspection to inspect the integrity of all the components of the remedy put in-place. It is assumed ~~that annual O&M cost would be incurred annually from Year 2013.~~ 2	$2,000
Evaluating and Updating Institutional Controls	Annual O&M Cost	The cost includes annual evaluation and update of the implemented institutional controls at the OU1 site.	$2,000
Cover Maintenance (Minor Breaches)	Annual O&M Cost	Includes annual cost for O&M of the OU1 remedy. Breaches that can be repaired without additional excavation of contaminated soils are considered as Minor Breaches.	$15,000
Cover Maintenance (Major Breaches)	Periodic O&M Cost	Includes periodic costs for repairing major breaches to the protective cover. It may include additional excavation of contaminated materials To secure the disturbed areas.	$21,000
		Total Probable Cost Over 30 Years	**$696,000**

Note:

1. Detailed costs and backup are presented in Appendix B of the OU1 O&M Plan (EPA 2013).
2. Costs are rounded to the nearest $1,000.
3. Costs based on 2013 prices.
4. Costs presented are expected to have accuracy between -30% to +50% of actual cost, based on the scope presented.

Table 8-3 Summary of Probable Operations and Maintenance Cost Incurred by EPA

O&M Component	Cost Type	Description	Cost
Five-Year Site Review	Periodic Cost	Includes costs for site visit and a five-year site review report and also includes setting up a community meeting to inform the local community about the status of the OU1 site. It is assumed that the five-year review cycle would start during year ~~2017.~~ 2015	$50,000
		Total Probable Cost Over 30 Years	**$300,000**

Note:

1. Detailed costs and backup are presented in Appendix B of the OU1 O&M Plan (EPA 2013).
2. Cost is rounded to the nearest $1,000.

Table 8-1 Summary of Probable Operations and Maintenance Cost Incurred by City of Libby

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		Total Probable Cost Over 30 Years	**$1,511,000**

Note:

1. Detailed costs and backup are presented in Appendix B of the OU1 O&M Plan (EPA 2013).
2. Costs are rounded to the nearest $1,000.
3. Costs based on 2013 prices.
4. Costs presented are expected to have accuracy between -30% to +50% of actual cost, based on the scope presented.

Table 8-2 Summary of Probable Operations and Maintenance Cost Incurred by DEQ

O&M Component	Cost Type	Description	Cost
Routine Site Inspection	Annual O&M Cost	Includes annual site inspection to inspect the integrity of all the components of the remedy put in-place. It is assumed that annual O&M cost would be incurred annually.	**$2,000**
Evaluating and Updating Institutional Controls	Annual O&M Cost	The cost includes annual evaluation and update of the implemented institutional controls at the OU1 site.	**$2,000**
Cover Maintenance (Minor Breaches)	Annual O&M Cost	Includes annual cost for O&M of the OU1 remedy. Breaches that can be repaired without additional excavation of contaminated soils are considered as Minor Breaches.	**$15,000**
Cover Maintenance (Major Breaches)	Periodic O&M Cost	Includes periodic costs for repairing major breaches to the protective cover. It may include additional excavation of contaminated materials to secure the disturbed areas.	**$21,000**
		Total Probable Cost Over 30 Years	**$696,000**

Note:

1. Detailed costs and backup are presented in Appendix B of the OU1 O&M Plan (EPA 2013).
2. Costs are rounded to the nearest $1,000.
3. Costs based on 2013 prices.
4. Costs presented are expected to have accuracy between -30% to +50% of actual cost, based on the scope presented.

Table 8-3 Summary of Probable Operations and Maintenance Cost Incurred by EPA

O&M Component	Cost Type	Description	Cost
Five-Year Site Review	Periodic Cost	Includes costs for site visit and a five-year site review report and also includes setting up a community meeting to inform the local community about the status of the OU1 site. It is assumed that the five-year review cycle would start during year 2015.	**$50,000**
		Total Probable Cost Over 30 Years	**$300,000**

Note:

1. Detailed costs and backup are presented in Appendix B of the OU1 O&M Plan (EPA 2013).
2. Cost is rounded to the nearest $1,000.
3. Costs based on 2013 prices.

3. Costs based on 2013 prices.
4. Costs presented are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented.

Additional Cost Tables

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Section 9

Observations and Lessons Learned

This section provides observations and lessons learned from implementation of the Libby OU1 RA construction activities including successes, problems encountered, and resolutions.

9.1 Successes

OU1 posed a unique relationship with the City, relative to the other OUs, where the City retained a designer to develop and propose the park finish grade elevations and features. The USEPA established removal and restoration limits based on the City's proposed final grade elevation. This approach required significant City involvement and participation in finalizing plans prior to and managing modifications during construction. A City council representative was delegated as the point of contact and responsible for conveying project issues to their designer. The request for information, design modifications, and material submittal approval processes went smoothly with no impact to construction schedule.

The greater majority of other OU protocols was to uniformly remove contaminated soil to a specified depth below original grade and restored in kind. Because OU1 proposed finish grade elevations varied across the site the depth of excavations likewise varied accordingly. Subsequently, a staked grid of 25-feet on-center was surveyed and each point stake was labeled with depth of excavation. The excavator operators interpolated between stakes to establish proposed topography. The system proved effective to achieve proposed depth of excavation and mitigate unintended over-excavation while achieving the minimum 18 inches of imported soil cover.

Due to the OU1 areal expanse, over 200 confirmation soil samples were anticipated. The USEPA requested laboratory analysis on a 24-hour turn-around basis to accommodate the fast-track removal process. When analytical results exceeded 1% LA, the excavation crews were able to efficiently and effectively return to those discrete polygon removal areas to over-excavate without cross-contaminating cleared polygons. This protocol required a number of individuals and systems to closely communicate and coordinate.

9.2 Problems Encountered and Resolutions

The EPA was evaluating and adjusting restoration materials sections to maximize cost efficiency. Consequently, at other OUs, the top soil section was revised from 6 inches to 4 inches. However, during OU1 embankment restoration, it was determined that the 4-inch section was insufficient for grass seeds to substantially establish. Therefore, 6 inches of top soil was restored to the OU1 embankments.

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Section 10

Libby OU1 Contact Information

Contact information for the key OU1 RA project personnel is presented below.

Name	Title	Organization	Contact Information
Dania Zinner	Remedial Project Manager	EPA Region VIII	1595 Wynkoop Street, 8EPR-SR Denver, CO 80202 (303) 312-6552 zinner.dania@epamail.epa.gov
Carolyn Rutland, Ph.D.	Project Manager	DEQ	P.O. Box 200901 Helena, MT 59620 (406) 841-5036 crutland@mt.gov
Mary Darling, PMP	Project Manager	USACE	Building 525, Room 324 P.O. Box 13287 Offutt AFB, NE 68113 (402) 995-2116 mary.n.darling@usace.army.mil
Jason Lynch	Project Manager	PRI-ER	60 Port Boulevard Libby, MT 59923 (303) 503-4672 jlynch@priworld.com
Thomas Cook, PMP	Project Manager	CDM Smith	60 Port Boulevard, Suite 201 Libby, MT 59923 (406) 293-8595 cookte@cdmsmith.com
Dominic Pisciotta	ERS Manager	CDM Smith	60 Port Boulevard, Suite 201 Libby, MT 59923 (406) 291-5335 picsiottadm@cdmsmith.com

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Section 11

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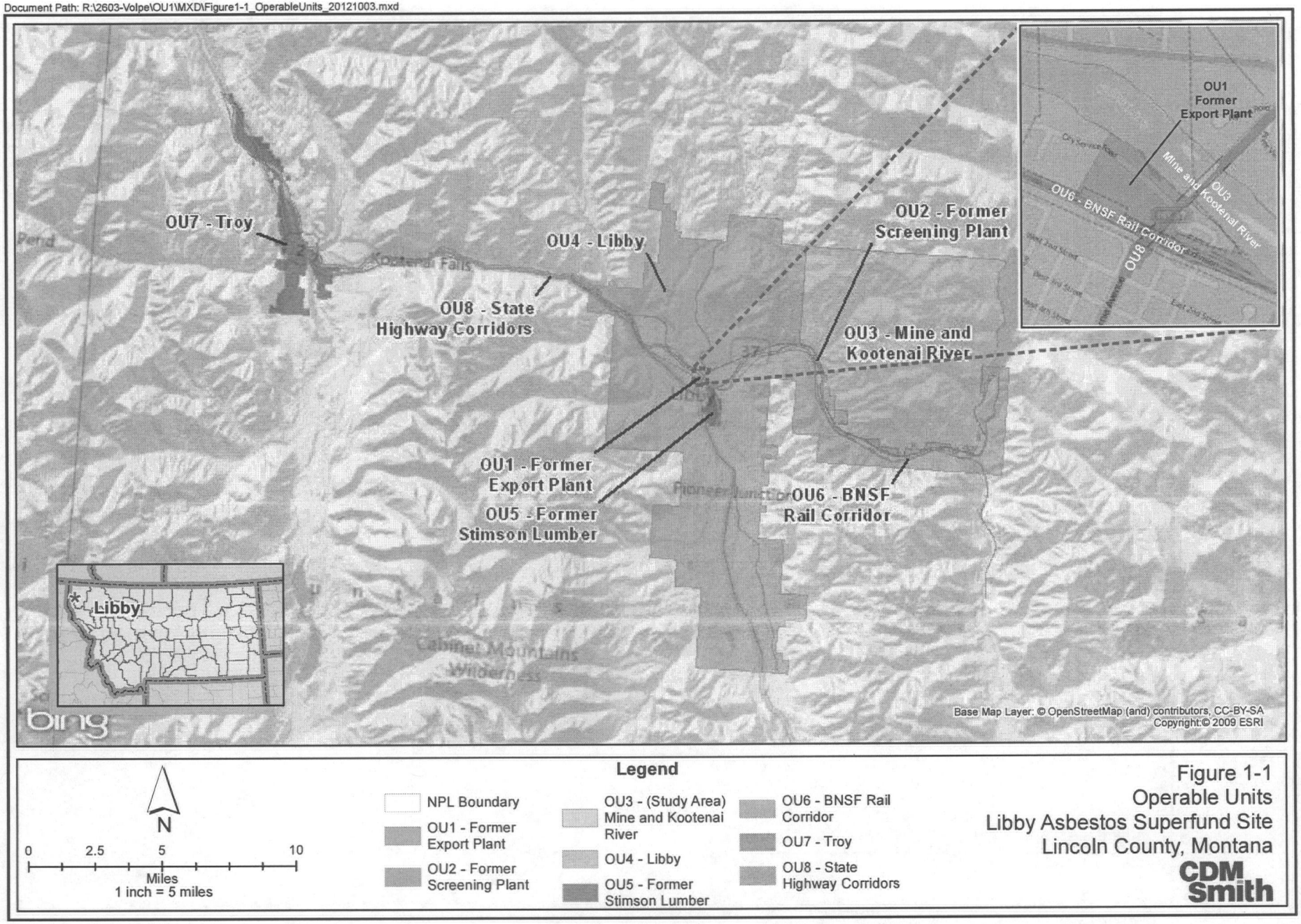
Figures

Document Path: R:\2603-Volpe\OU1\MXD\Figure1-1_OperableUnits_20121003.mxd



N

0 2.5 5 10

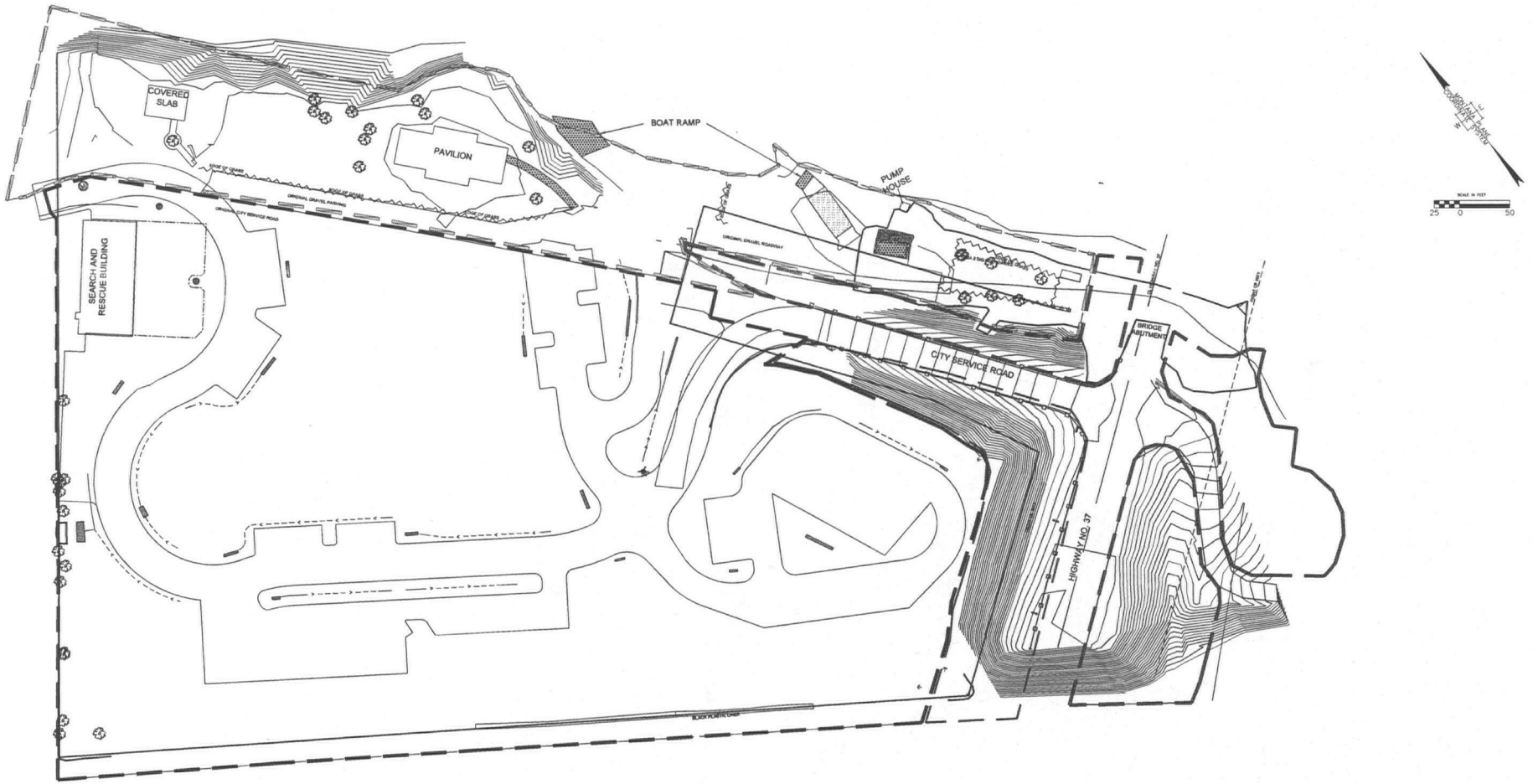
Miles
1 inch = 5 miles

Legend

- NPL Boundary
- OU1 - Former Export Plant
- OU2 - Former Screening Plant
- OU3 - (Study Area) Mine and Kootenai River
- OU4 - Libby
- OU5 - Former Stimson Lumber
- OU6 - BNSF Rail Corridor
- OU7 - Troy
- OU8 - State Highway Corridors

Figure 1-1
Operable Units
Libby Asbestos Superfund Site
Lincoln County, Montana

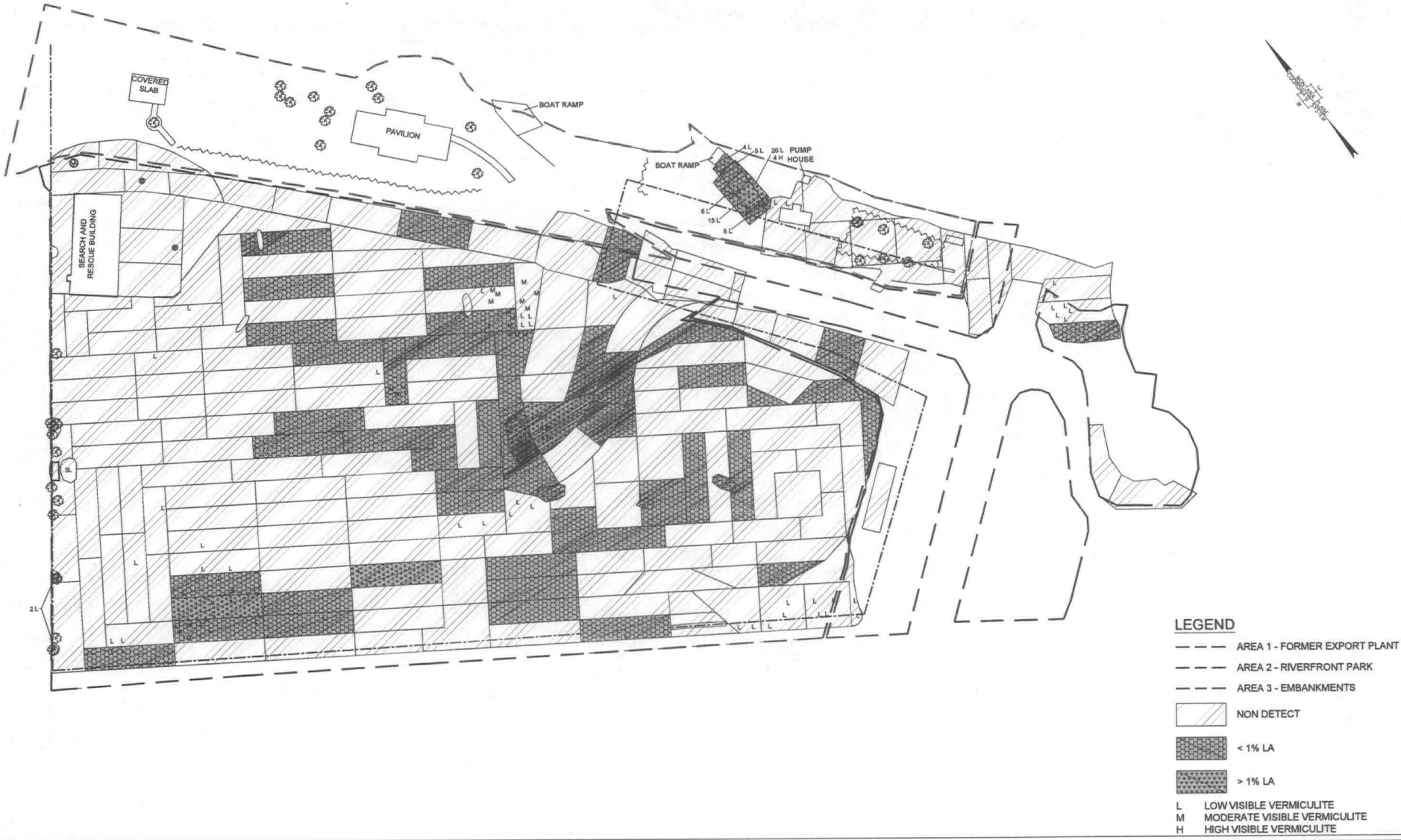
CDM Smith



OU1 SITE MAP
FIGURE 1-2
LIBBY ASBESTOS SUPER FUND SITE
LINCOLN COUNTY, MONTANA

SCALE IN FEET
25 0 50

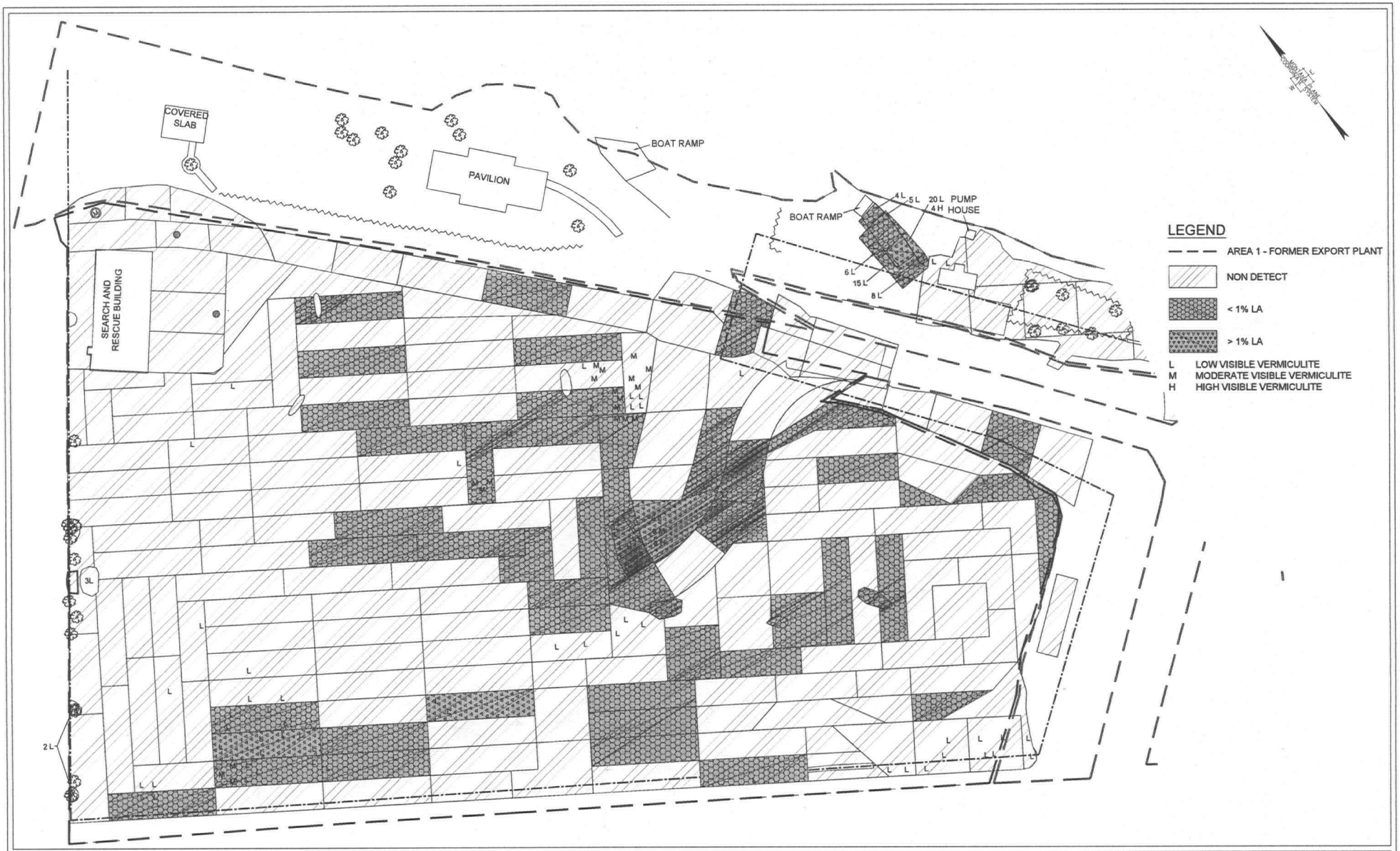
CDM Smith
CDM Federal Programs
60 Port Boulevard
Libby, MT 59923
Tel: (406) 293-6595



SCALE IN FEET
25 0 50

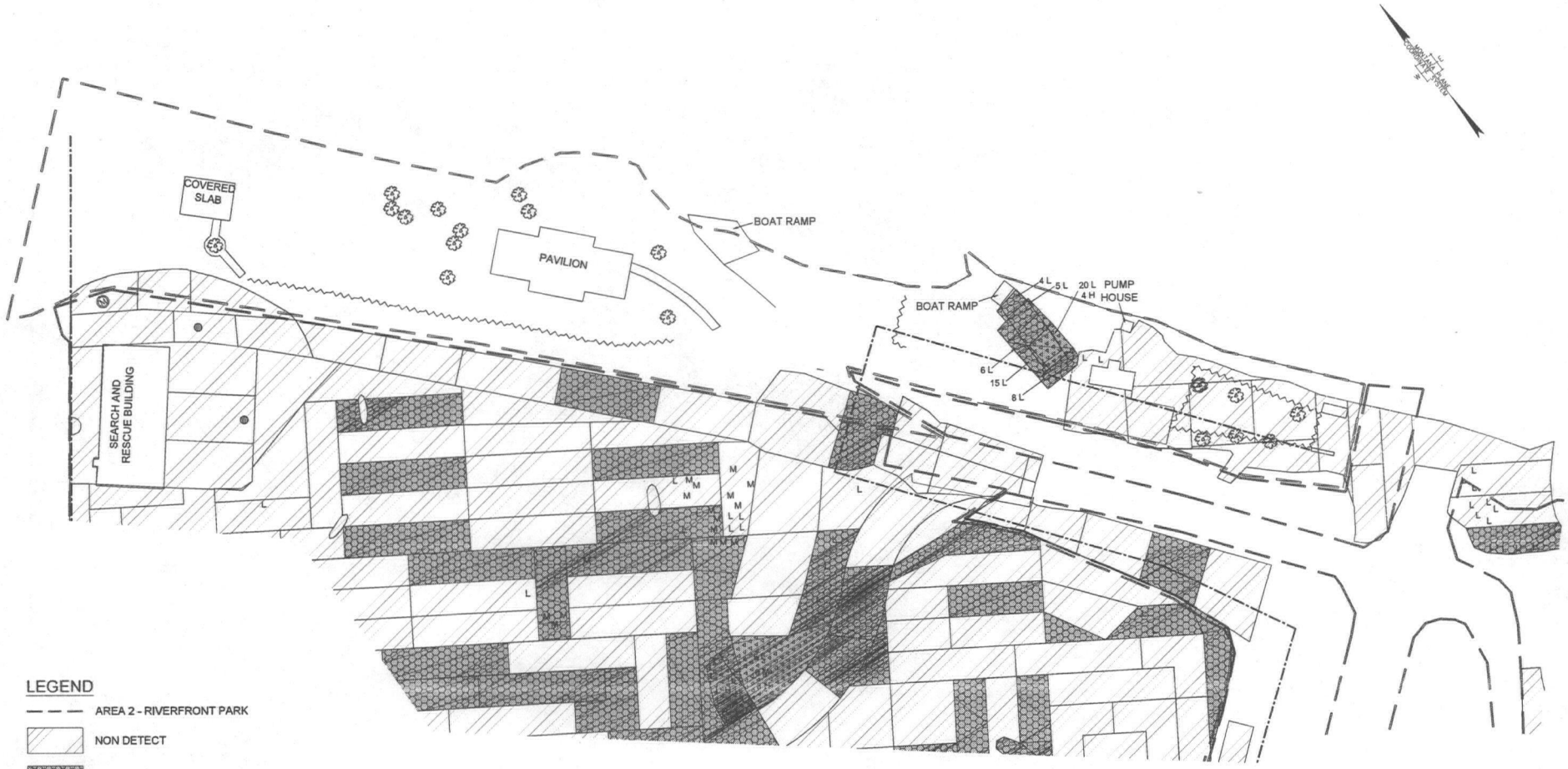
LOCATION OF RESIDUAL CONTAMINATION AT OU1 OVERVIEW
FIGURE 3-1
LIBBY ASBESTOS SUPER FUND SITE
LINCOLN COUNTY, MONTANA

CDM Smith
CDM Federal Programs
60 Port Boulevard
Libby, MT 59923
Tel (406) 293-6585



LOCATION OF RESIDUAL CONTAMINATION AT OU1 AREA 1
FIGURE 3-2
LIBBY ASBESTOS SUPER FUND SITE
LINCOLN COUNTY, MONTANA

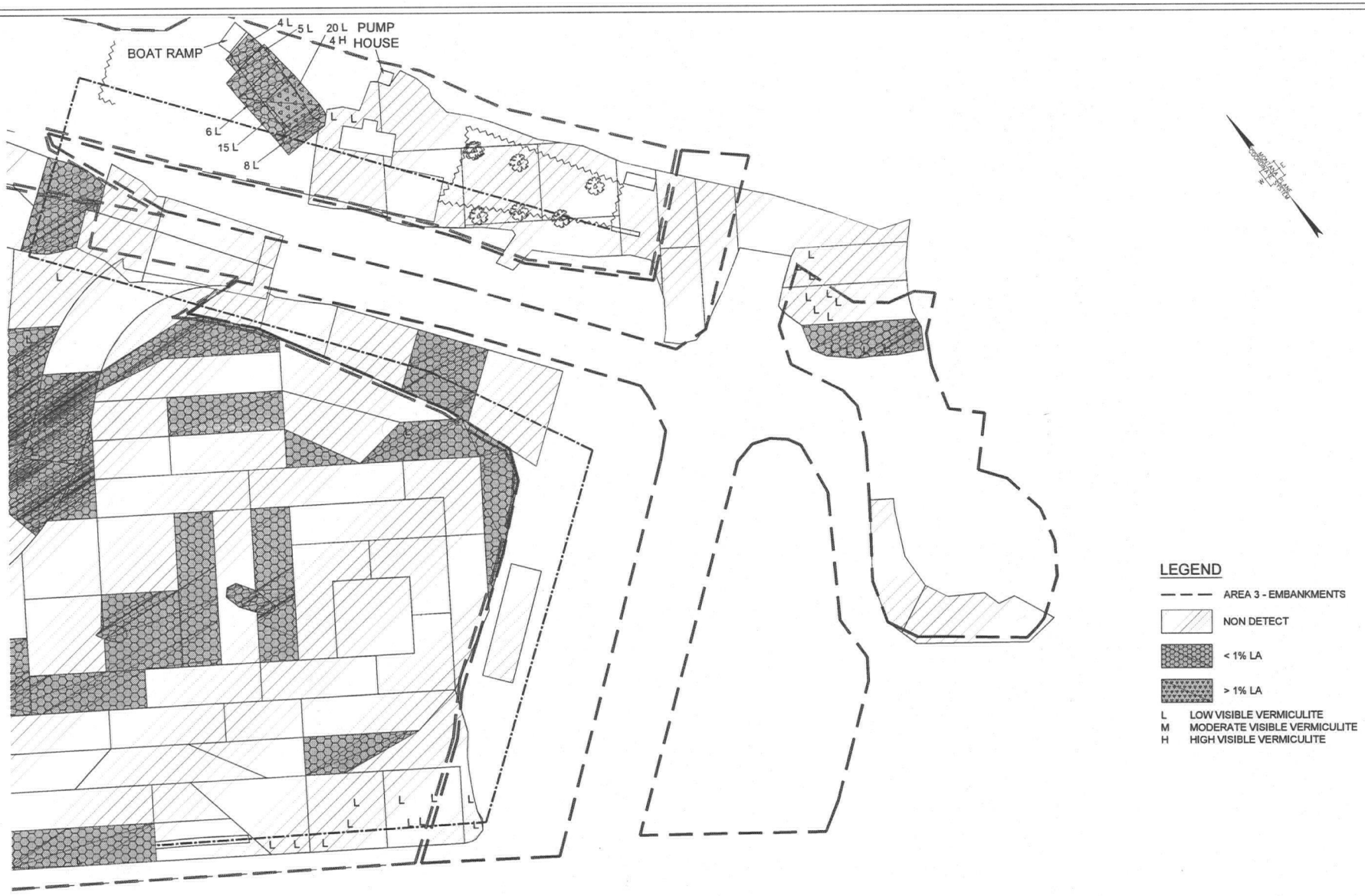
CDM Smith
CDM Federal Programs
60 Port Boulevard
Libby, MT 59923
Tel (406) 293-8585



LOCATION OF RESIDUAL CONTAMINATION AT OU1 AREA 2
FIGURE 3-3
LIBBY ASBESTOS SUPER FUND SITE
LINCOLN COUNTY, MONTANA

SCALE IN FEET
20 0 40

CDM Smith
CDM Federal Programs
60 Port Boulevard
Libby, MT 59923
Tel: (406) 293-8595



LOCATION OF RESIDUAL CONTAMINATION AT OU1 AREA 3
FIGURE 3-4
LIBBY ASBESTOS SUPER FUND SITE
LINCOLN COUNTY, MONTANA

SCALE IN FEET
15 0 30

CDM Smith
CDM Federal Programs
60 Port Boulevard
Libby, MT 59923
Tel: (406) 293-6285

Appendix A

Cost Summary

Appendix B

OU1 As-Builts

Appendix C
Analytical Results

Appendix D

RA Construction Documents

Appendix E

Change / Modification Logs

Appendix F

Joint Site Inspection Memorandum

CERTIFICATE OF COMPLETION

This is to certify that

Robyn Blackburn

has completed the course

FY13 Security Awareness and Training - epa_sat_fy13_fgc_enus

on

07/08/13

Libby Asbestos Superfund Site
The Former Export Plant Site,
Operable Unit 1
Lincoln County, Montana

Final Remedial Action Report

USACE Contract No. W9128F-11-D-0023

Task Order No.: 0003
EPA RPM: Dania Zinner

June 25, 2013

Prepared for:
U.S. Environmental Protection Agency
Region VIII
1595 Wynkoop Street
Denver, Colorado 80202

Prepared b
U.S. Army Corps of
Omaha Distr
Offutt AFB, Nebras

and

CDM Federal Programs
555 17th Street, Su
Denver, Colorado

Previous Versions

Libby Asbestos Superfund Site
The Former Export Plant Site,
Operable Unit 1
Lincoln County, Montana

Final Remedial Action Report

USACE Contract No. W9128F-11-D-0023

Task Order No.: 0003
EPA RPM: Dania Zinner

June 25, 2013

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Prepared by:
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Libby Asbestos Superfund Site
The Former Export Plant Site,
Operable Unit 1
Lincoln County, Montana

Final Remedial Action Report

USACE Contract No. W9128F-11-D-0023
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Abbreviations and Acronyms

AC	asphaltic concrete
ABS	activity-based sampling
AHERA	Asbestos Hazard Emergency Response Act
bgs	below ground surface
BNSF	Burlington Northern Santa Fe
CDM Smith	CDM Federal Programs Corporation
CHASP	Comprehensive Site Health and Safety Plan
City	City of Libby
cy	cubic yards
DEQ	Montana Department of Environmental Quality
ERS	Environmental Resource Specialist
FS	feasibility study
f/cc	fibers per cubic centimeter
ft^2	square foot
GPI	general property investigation
GPS	global positioning system
Grace	W.R. Grace and Company
HASP	Health and Safety Plan
IC	institutional control
ICIAP	Institutional Control Implementation and Assurance Plan
ISO	International Organization for Standardization
LA	Libby amphibole asbestos
JSI	joint site inspection
MDT	Montana Department of Transportation
ND	non-detect
NIOSH	National Institute for Occupational Safety and Health
O&F	operational and functional
O&M	operations and maintenance
OU	operable unit
PCM	phase contrast microscopy
PLM	polarized light microscopy
PPE	personal protective equipment
PRI-ER	Project Resources, Inc – Environmental Restoration, Joint Venture
QA	quality assurance
QAR	Quality Assurance Report
QC	quality control
RA	remedial action
RAO	remedial action objective
RAWP	Response Action Work Plan
RC	removal contractor
RG	remedial goal
RI	remedial investigation
ROD	Record of Decision
ROW	right-of-way
s/cc	structures per cubic centimeter
s/cm^2	structures per square centimeter
	Libby Asbestos Superfund Site

Site	Syracuse Research Corporation
SRC	transmission electron microscopy
TEM	third party quality assurance
TQA	U.S. Army Corps of Engineers
USACE	
≥	greater than or equal to
<	less than
%	percent

Section 1
Introduction

1.1 Site Name and Location

The Libby Asbestos Superfund Site (Site) (CERCLIS # MT0009083840) is located in and around the City of Libby (City), Montana. Libby is the county seat of Lincoln County and lies in the northwest corner of Montana, about 35 miles east of Idaho and 65 miles south of Canada. The Site is divided into eight operable units (OUs) (Figure 1-1).

OU1 encompasses an area of approximately 17 acres and is situated on the south side of the Kootenai River, just north of the downtown area of Libby, Montana. The property is bounded by the Kootenai River to the north, residential property to the east, the BNSF railroad thoroughfare to the south, and State of Montana property to the west (Figure 1-2).

The OU1 site was historically owned and used by W.R. Grace and Company (Grace) for stockpiling, staging, and distributing vermiculite and vermiculite concentrate to vermiculite processing areas and insulation distributors outside of Libby. Because vermiculite mined from Libby has been found to be contaminated with Libby amphibole asbestos (LA), a known human health risk, the U.S. Environmental Protection Agency (EPA) initiated an emergency response action in November 1999 to address questions and concerns raised by citizens of Libby regarding possible ongoing exposures to asbestos fibers as a result of historical mining, processing, and export of asbestos-containing vermiculite.

Based on current land use, the site on the west side of Highway 37 is divided into two distinct areas separated by City Service Road (also known as West Thomas Street): the area of the site to the south of City Service Road (approximately 12 acres) and a 4.7-acre recreational area known as Riverfront Park (formerly known as Riverside Park) to the north of City Service Road. For discussion purposes, these areas will be referred to throughout this report as Area 1 and Area 2, respectively. In addition, the embankments of Highway 37 on both sides of the highway on the south side of the Kootenai River, City Service Road, and Thomas Street are included as part of OU1 because of their immediate proximity to the site and the known presence of vermiculite. These areas will be referred to throughout this report as Area 3.

1.2 Key Features of the Libby Asbestos Superfund Site and OU1

1.2.1 Site OUs

To facilitate a multi-phase approach to remediation of the Site, eight separate OUs have been established. These OUs are shown in Figure 1-1 and include:

- **OU1.** OU1 is the subject of this remedial action (RA) report and includes the former Export Plant. OU1 is situated on the south side of the Kootenai River, just north of the downtown area of the City. OU1 includes the embankments of Highway 37, the former Export Plant, and Riverfront Park (formerly known as Riverside Park). The property is bounded by the Kootenai

River to the north, residential property to the east, the BNSF railroad thoroughfare to the south, and State of Montana property to the west.

- **OU2.** OU2 includes areas impacted by contamination released from the former Screening Plant. These areas include the former Screening Plant (Subarea 1), the Flyway property (Subarea 2), a privately-owned property (Subarea 3), and the Rainy Creek Road Frontages (Subarea 4). The Highway 37 right-of-way (ROW) adjacent to OU2 was included due to the proximity to OU2 and the known contamination in the ROW. For the purposes of this report, the contaminated portion of the Highway 37 ROW is considered part of Subareas 2 and 3 within OU2.

- **OU3.** The mine OU includes the former vermiculite mine and the geographic area (including ponds) surrounding the former vermiculite mine that has been impacted by releases from the mine, including Rainy Creek and the Kootenai River. Rainy Creek Road is also included in OU3. The geographic area of OU3 is based primarily upon the extent of contamination associated with releases from the former vermiculite mine.

- **OU4.** OU4 is defined as residential, commercial, industrial (not associated with former Grace operations), and public properties, including schools and parks, in and around the City, or those that have received material from the mine not associated with Grace operations. OU4 includes only those properties not included in other OUs.

- **OU5.** OU5 includes all properties that were part of the former Stimson Lumber Mill and are now owned and managed by the Kootenai Business Park Industrial Authority.

- **OU6.** The rail yard owned and operated by BNSF is defined geographically by the BNSF property boundaries and the extent of contamination associated with BNSF rail operations. Railroad ROW are also included in this OU and have not been geographically defined.

- **OU7.** The Troy OU includes all residential, commercial, and public properties in and around the Town of Troy, approximately 20 miles west of downtown Libby.

- **OU8.** OU8 is comprised of the US and Montana State Highways and secondary highways that lie within the boundaries of OU1, OU4, and OU7.

1.2.2 Site Contamination

This section provides information about the contamination in OU1 that existed at the time of the Record of Decision (ROD). All areas that were subject to previous investigation and removal actions but no longer pose a threat to human health and the environment will be monitored as part of the Selected Remedy. Previous investigations and removal actions are chronologically presented below.

OU1, from the early 1960s to approximately 1990, was used by Grace as the Export Plant for stockpiling, staging, and distributing vermiculite and vermiculite concentrate to vermiculite processing areas and insulation distributors outside of Libby. Ownership was transferred to the City in the mid-1990s.

The vermiculite deposit that was mined by Grace contains a distinct form of naturally-occurring amphibole asbestos that is comprised of a range of mineral types and morphologies. In various past reports, this form of amphibole asbestos has been termed interchangeably by the EPA as Libby Amphibole or more simply, LA. The term LA refers generally to amphibole materials that originated in the Libby vermiculite deposit, have the ability to form durable, long, and thin structures that are

generally respirable, can reasonably be expected to cause disease, and hence are considered the contaminant of concern at the site.

Because vermiculite mined from Libby has been found to be contaminated with LA and, known to cause human health effects, the EPA initiated an emergency response action in November 1999 to address questions and concerns raised by citizens of Libby regarding possible ongoing exposures to asbestos fibers as a result of historical mining, processing, and exportation of asbestos-containing vermiculite.

1.3 Site Background

Numerous hard rock mines have operated in the Libby area since the 1880s, but the dominant impact to human health and the environment in Libby has been from vermiculite mining and processing. Prospectors first located vermiculite deposits in the early 1900s on Rainy Creek northeast of Libby. Edward Alley, a local rancher, was also a prospector and explored the old gold mining tunnels and digs in the area. Reportedly, while exploring tunnels in the area, he stuck his miner's candle into the wall to chip away some ore samples. When he retrieved his candle, he noticed that the vermiculite around the candle had expanded, or "popped," and turned golden in color.

In 1919, Alley bought the Rainy Creek claims and started the vermiculite mining operation called the "Zonolite Company." While others thought the material was useless, he experimented with it and discovered it had good insulating qualities. Over time, vermiculite became a product used in insulation, feed additives, fertilizer/soil amendments, construction materials, absorbents, and packing materials. Many people used vermiculite products for insulation in their houses in and around the Site and soil additives in their gardens. In 1963, Grace bought the mine and associated processing facilities and operated them until 1990.

From the early 1960s to approximately 1990, the Export Plant was used by Grace for stockpiling and distributing vermiculite concentrate to Grace expansion plants, where vermiculite was heated and "popped" into its expanded form so that it could be used for insulation and other uses, and customers throughout the United States. Ownership was transferred to the City in the mid-1990s.

Throughout its history, portions of both OU1 Area 1 and 2 of the site have been leased to various parties for commercial and non-commercial enterprises. From approximately 1977 to 1997, organized youth baseball events (games and practices) were held at ball fields, which are centrally located in OU1 Area 1. Between approximately 1987 and 2000, the Millwork West Company, a retail lumberyard and building material supplier, leased the northwestern portion of Area 1. As described in Section 2 of this report, buildings and equipment used by Millwork West were removed and/or demolished as part of the removal activities conducted by Grace in 2001 and 2002.

Other commercial and industrial uses of the site also occurred in the past that utilized infrastructure at the site. These other commercial/industrial uses reportedly included a metal scrap dealer and a larch tree gum manufacturer. The infrastructure that supported these businesses included industrial power supply, a railroad spur, and truck scales. This infrastructure was removed during the removal activities conducted at the site.

1.3.1 Current Use

Area 1 is currently owned by the City and is undeveloped, with the exception of a small area of the site currently used by David Thompson Search and Rescue. In 2004, the search and rescue organization

constructed a building containing a main office and a five-bay garage on the northwest portion of the site on the south side of City Service Road. The garage is used for storing search and rescue equipment and vehicles. Several other agencies, including local and state law enforcement, also hold meetings in the main office. EPA has provided guidance to the City when conducting activities at the site that disturb soil.

Area 2, Riverfront Park, is also currently owned by the City and serves a variety of recreational visitors. The main features of Area 2 include two boat ramps, a pavilion, picnic tables, and a pumphouse. The newer of the two boat ramps is used by recreational boaters and commercial fishing outfitters; the older ramp is not commonly used due to swift current at its approach. The pumphouse houses a pump that draws non-potable water from the Kootenai River. The pump was installed jointly by the City and Lincoln County in 1999 to provide a backup water source to local fire departments. The pumphouse is accessed by City personnel in order to perform maintenance on the pump. The pump is connected to an external water spigot, which is used by the City to draw water for street sweeping and other maintenance operations, and for other workers (such as employees of local fill pits and contractors working on EPA's removal program) to draw water primarily for use in dust suppression equipment. Access to Area 2 is unrestricted.

Area 3 is owned and maintained by the Montana Department of Transportation (MDT). MDT currently performs only periodic maintenance of these embankments as needed. The types of maintenance activities conducted by MDT include application of herbicides, replacement of guardrails and guardrail posts, and replacement and maintenance of roadside light posts. Access to this area is unrestricted.

1.3.2 Future Use

Future use of Area 1 is a proposed City park. This RA report addresses the remedial activities that precede the park features development. The City expects that David Thompson Search and Rescue will continue to utilize the northwest portion of the site. A change in land use is not currently anticipated for Area 2 (Riverfront Park), though the river revetment to the east was refortified and is included in this RA report. It is also anticipated that Area 3 will not change use and will remain undeveloped and owned and maintained by MDT.

1.4 Report Organization

In accordance with the EPA guidance for National Priorities List site close-out procedures (EPA 2011a), this report is organized into the following ten sections and three appendices. Minor rearrangement of the section contents recommended by the guidance was made to the report for clarity.

- **Section 1 - Introduction**: provides a description and history of the site.
- **Section 2 - Operable Unit 1 Background**: provides a summary of the pre-ROD investigation and removal actions, the ROD requirements and remedial action objectives (RAOs) for OU1, and a summary of the remedial design.
- **Section 3 - Construction Activities**: provides a summary of the RA construction activities conducted and a summary of soil sample results.
- **Section 4 - Chronology of Events**: provides a chronology of major events for OU1, starting with the signing of the ROD.

- **Section 5 - Performance Standards and Construction Quality Control**: provides a comparison of current site conditions to the RAOs, a description of construction quality assurance and control, and brief overview of quality assurance/quality control (QA/QC) procedures employed.
- **Section 6 - Final Inspections and Certifications**: provides a summary of site inspections, adherence to health and safety requirements during the RA, and the approach for institutional controls (ICs).
- **Section 7 - Operation and Maintenance Activities**: provides a description of the monitoring and maintenance programs that will be in place to ensure that the selected remedy continues to provide protection of human health and the environment.
- **Section 8 - Summary of Project Costs**: provides a summary of project costs associated with the RA to present, including projected operations and maintenance (O&M) costs, and a comparison of actual costs to the cost estimates in the ROD.
- **Section 9 - Observations and Lessons Learned**: provides a description of successes, problems encountered, and solutions related to the RA implementation.
- **Section 10 - Operable Unit 1 Contact Information**: provides a list of contact information for personnel involved in the OU1 RA and O&M, including EPA personnel, Montana Department of Environmental Quality (DEQ) personnel, and RA contractor personnel.
- **Appendix A - Cost Summary**: provides a more detailed breakout of incurred costs reported in Section 8.
- **Appendix B - RA Construction As-Builts**: provides RA as-built drawings.
- **Appendix C - Analytical Results:** provides summary tables for confirmation soil results and personal and perimeter air sample results.
- **Appendix D - RA Construction Documents**: provides documentation of RA construction including Quality Assurance Reports (QARs), and soil compaction results
- **Appendix E - Change / Modification Logs**: provides documentation of design modifications made during the removal and restoration activities due to unforeseen conditions.
- **Appendix F - Joint Site Inspection Memorandum**: provides documentation of the joint site inspection findings conducted on August 8, 2012.

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Section 2

Operable Unit 1 Background

Investigation and removal activities have been ongoing at the Site in general, and OU1 in specific, since the EPA began its emergency response in 1999. As a result, much of OU1 had already undergone significant remediation by the time the RI/FS was completed. It was determined that the actions consisting of excavation, offsite disposal and engineered cover were adequate to protect human health and the environment. The following sections summarize pre-ROD investigation and removal activities and outline the ROD requirements. For more details on pre-ROD events, refer to the OU1 Final RI Report (EPA 2009a).

2.1 OU1 Historical Investigations and Response Activities

Multiple investigation, pre-removal, and removal events occurred from 1999 until the signing of the OU1 ROD in 2010. The following is a summary of those events by area. For detailed accounts of these events, including sample information and analytical results, refer to the OU1 Final RI Report (EPA 2009a). Confirmation soil sample depths were measured from the bottom of the excavation (i.e., excavation floor is 0 inches below ground surface [bgs]). All other soil sample depths were measured from existing ground surface at the time of sampling.

In general, investigatory soil samples were analyzed using two Libby Site-specific polarized light microscopy (PLM) methods: a visual estimation method (PLM-VE) (Syracuse Research Corporation [SRC] 2003) and a gravimetric method (PLM-Grav) (SRC 2002). Confirmation soil and investigatory bulk material samples were analyzed using the National Institute of Occupational Safety and Health (NIOSH) polarized light microscopy (PLM) method 9002 (NIOSH 1994a). Air samples were analyzed using one or more of the following methods: the NIOSH phase contrast microscopy (PCM) method 7400 (NIOSH 1994b); the transmission electron microscopy (TEM) Asbestos Hazard Emergency Response Act (AHERA) requirements provided in Appendix A to Subpart E of 40 Code of Federal Regulations 763.86. (EPA 1987); and the TEM method International Organization for Standardization (ISO) 10312 (ISO 1995). Dust samples were analyzed using the TEM AHERA method (EPA 1987). In addition, all of these analytical methods employed Libby Site-specific modifications, as were current and approved by the EPA at the time of analysis.

2.1.1 Area 1

- **Investigation Soil Sampling – December 1999.** In December 1999, a total of 80 soil samples (72 samples and 8 field duplicates) were collected from Area 1. Samples were collected as grab samples from the 0- to 2-inch, 0- to 24-inch, or 2- to 12- inch depth interval and analyzed by PLM. Analytical results ranged from non-detect (ND) to 5 percent (%) LA.

- **Investigation Soil and Air Sampling – March/April 2000.** Between March 10 and 11, 2000, 17 grab soil samples and one duplicate were collected from the 0- to 2-inch depth interval, and 16 grab soil samples and five field duplicates from the 2- to 12-inch depth interval. One grab sample was also collected from bags of vermiculite stored outside the warehouse. PLM analytical results ranged from ND to 10% LA.

- In addition to soil sampling, ambient air samples were collected from various locations within the Area 1 boundary on separate days in April 2000 from high-volume stationary air samplers. TEM analytical results indicated LA in ambient air at all three sample locations at concentrations ranging from 0.0001 to 0.0023 structures per cubic centimeter (s/cc).

- **Activity-Based Sampling (ABS) – June 2000.** Two samplers were monitored during the event: one while sweeping the floor of the planar shop's break room; the other while sweeping and moving bags of vermiculite insulation inside the bag house portion of the planar shop. TEM analytical results for the two personal air samples indicated LA in concentrations of 0.6470 s/cc and 2.3666 s/cc for the sweeper and the bag mover, respectively.

- **Area 1 Removal Event – July 2000 through January 2001.** Grace temporarily relocated the onsite business (Millwork West), cleaned five onsite historic buildings and the building's contents, excavated and disposed of vermiculite and LA-contaminated soil and debris, and restored the property. Contaminated materials were disposed of at the former Libby vermiculite mine.

- During soil excavation, 63 confirmation soil samples were collected from the floor of the excavation of which a total of 18 split samples and one duplicate split sample were analyzed. PLM results ranged from ND to 2% LA. Grace, however, was directed to remove additional soil in 4- to 6-inch increments until EPA removal clearance criterion of less than (<) 1% LA was met in each section of the excavation.

- The backfill materials used at Area 1 were obtained from the EPA-approved source Plum Creek pit located in Libby. Restoration at Area 1 consisted of backfilling the entire excavated area with a sufficient layer of common fill to bring the grade to within 6 inches of the original surveyed grade. The final 6 inches were filled with either gravel or topsoil, as appropriate, depending upon the original surface conditions.

- **Area 1 Investigation Sampling – March/April/August 2001.** A total of 15 soil samples were collected at Area 1, as follows:

  - three grab samples were collected from the 0- to 1-inch depth interval near site buildings;
  - five grab samples and one duplicate were collected from the 0- to 6-inch depth interval near site buildings;
  - one grab sample of in-place 1 ½ -inch minus grade fill material (from the Granite pit) from the 0- to 6-inch depth interval;
  - one 3-point composite sample was collected from the 0- to 4-inch depth interval at the site on/off ramp; and
  - one 3-point composite sample was collected from 0- to 4-inch depth interval near the BNSF railroad tracks.

  Four grab samples were collected from the 0- to 4-inch depth interval. Analytical results for LA by PLM ranged from ND to 35% in the soil samples, and ND for LA for the in-place fill material sample.

Thirty-nine bulk material samples (e.g., wood shavings, insulation, debris, etc.) were collected from within the five buildings. Seven samples were collected within the pole barn; seven within the planar shop; six within the scale house/lumber storage building; 13 within the warehouse; and six within the shed. Analytical results by PLM of the bulk material samples ranged from ND to 5% LA.

Two, single-point dust samples were collected; one from a horizontal surface inside the warehouse and the other from the exterior surface of the warehouse foundation. TEM analytical results indicated 169,836 structures per square centimeter (s/cm^2) for LA in dust on the building's foundation, while the indoor sample was ND for LA. Four separate 3-point composite dust samples were collected from horizontal surfaces inside the pole barn, the surface of equipment stored inside the shed, and from the surface of equipment and supplies stored inside each of two site storage containers. Analytical results indicated 129,127 s/cm^2; 97,455 s/cm^2; 19,491 s/cm^2; and 40,200 s/cm^2 for LA, respectively.

- **Area 1 Removal Event – September/October 2001.** Grace conducted a cleanup action to address residual LA contamination in site buildings and soil. Ultimately, four of the five buildings (all but the planar shop) were demolished and additional soil was excavated from the site. The contaminated soil and debris was disposed of at the former Libby vermiculite mine. Confirmation soil samples and dust, for ambient air and personal air, were collected during the removal activities.

  Twenty-three subsurface confirmation soil samples were collected from depths varying between 16 and 50 inches bgs in the former pole barn, former warehouse, former scale house/lumber storage building, former shed, east ball fields, and BNSF spur extending just south of the planar shop. Composite samples of between two and five points were collected. Analytical results were <1% LA by PLM. Thirty-nine additional surface soil samples were collected from suspected of cross-contaminated areas that were previously remediated. These surface samples were 5-point composites from the 0- to 2-inch depth interval. Analytical results were either ND or <1% LA by PLM. In order to evaluate cleanup needs, eight additional soil samples were collected from areas that were not anticipated to have been impacted by removal activities; six were surface samples from 0 to 2 inches bgs, and two were subsurface samples from 8 to 10 inches bgs. PLM results of the surface samples were ND for LA, while the subsurface samples were <1% LA. Consequently, Grace covered impacted areas with a 4-inch layer of crushed gravel. Restoration was conducted with backfill materials obtained from the Plum Creek gravel pit located in Libby.

  One 3-point composite dust sample was collected from the surface of decontaminated lumber moved outside of the exclusion zone. Analytical results were ND for LA. One 3-point composite dust sample was collected from the surface of a lumber pile located inside the exclusion zone. Analytical results indicated LA loading at 365 s/cm^2. Additionally, six 3-point composite dust samples were collected in and around the planar shop. Analytic results for the six samples indicated LA loading of between 609 s/cm^2 and 444,636 s/cm^2. All dust samples were analyzed by TEM.

  Thirty-six personal air monitoring samples were collected during this removal effort. Analytical results for thirty samples, analyzed via TEM ISO 10312, indicated total LA concentrations ranging from ND to 0.0919 s/cc. Thirty-three samples were analyzed via TEM AHERA, indicating total LA concentrations ranging from ND to 0.09290 s/cc. Thirty-two samples were

analyzed via PCM, indicating concentrations ranging from ND to 0.231 fibers per cubic centimeter (f/cc).

- **Area 1 Investigation Sampling – April/May 2002.** Two, 3-point composite soil samples were collected from areas at the site where suspect mine-related material had been identified. Visible vermiculite was observed and believed to be cross-contaminated from BNSF railroad excavation activities. Analytical results indicated both samples contained <1% LA by PLM.

  Two bulk materials samples were collected from the interior of equipment owned and operated by Millwork West. Analytical results from both samples were ND for LA by PLM.

- **Area 1 Removal Event – October through December 2002.** Grace began removing the remaining building material and debris from Area 1. Contaminated soil from the footprint of the demolished planar shop and from an area near the BNSF railroad tracks was also removed. Contaminated soil and building materials were disposed of at the former Libby vermiculite mine. Forty-four, 5- point composite subsurface confirmation soil samples were collected from the floor of the excavations. A total of 36 soil samples were analyzed by PLM, while 8 samples were archived at a project-contracted laboratory. Analytical results were either ND or <1% LA. Restoration was conducted using backfill materials from the Plum Creek pit.

  Ten personal air samples were also collected and analyzed via PCM and analytical results ranged from ND to 0.492 f/cc.

- **Area 1 City Water Line Installation – June through September 2006.** The City began excavating a trench through the field portion of Area 1 in preparation for installing a new drinking water supply pipeline. A total of eight, 5-point composite soil samples were collected from the excavation spoils: four from the stockpiled material in the 0- to 2-inch depth interval and four from the 0- to 2-inch depth interval in the area adjacent to and surrounding the stockpile. Analytical results ranged from ND to 3% LA by PLM. Spoils were removed and transported to the former Libby vermiculite mine for disposal.

- **Other Area 1 Activity.** The City obtained approximately 50 cubic yards of angular riprap rock from the United States Army Corps of Engineers' (USACE's) Fisher River Road pit to cover two areas of exposed orange fencing: one revetment along the Kootenai River bank in between the new and old boat ramps and the other on the surface of the old boat ramp.

- **Area 1 Investigation Sampling – September to November 2007.** Forty-two surface (0 to 6 inches bgs) soil samples (including 3 field duplicates) were collected from Area 1. Samples were collected as 30-point composite samples. Analytical results indicated 29 samples as non-detect and 13 samples with trace amounts of LA by PLM.

  Visible vermiculite observations were made at a total of 1,170 point inspections. Vermiculite was not observed in 1,032 (88.2%) of the point inspections in Area 1. Low levels of vermiculite were observed at 118 (10.1%) of the point inspections; medium levels were observed at 16 (1.4%), of the point inspections; and high levels were observed at 4 (0.3%), of point inspections.

  ABS was conducted in the David Thompson Search and Rescue building. A total of 22 air samples were collected during the indoor ABS activities. TEM analytical results of the active-garage scenario ranged from ND to 0.0699 s/cc; active- meeting room results ranged from 0.0011 s/cc to 0.0088 s/cc; and passive-meeting room results ranged from 0.0003 s/cc to

0.0079 s/cc. Additionally, a total of nine microvacuum dust samples were collected from the building, three each from the meeting room, garage, and rescue vehicles. LA was detected in one sample collected from the meeting room and one sample collected from the garage. The total LA loading for the meeting room and garage dust samples were reported at 75 and 20 s/cm^2, respectively. Samples were analyzed by TEM.

Personal air samples were collected from the workers operating a bush hog. A total of eight personal air samples were collected during this activity. Of the eight samples collected, LA was detected in six samples and concentrations ranged from 0.0038 s/cc to 0.0715 s/cc by TEM.

2.1.2 Area 2

- **Area 2 Investigation Sampling – May/July 2003.** A 2-inch thick layer of vermiculite along the west side of the boat ramp was discovered during construction of a new boat ramp. The layer was approximately 8 to 10 inches below the ground surface. Additional vermiculite containing soil was exposed during renovation of the picnic area. A visual inspection and soil sampling was conducted. Three, 5-point composite soil samples from the 0- to 1-inch depth interval were collected. Analytical results were ND by PLM.

  Two 5-point composites soil samples from the 0- to 6-inch depth interval were subsequently collected. Results for the two samples, which were analyzed by all three PLM methods, ranged from ND to <1% LA.

- **Area 2 Pre-Removal Event – September/October 2003.** Pre-Removal characterization was conducted, which included a verbal interview, site visual inspection, and surface and subsurface soil sample collection. The verbal interview confirmed historical on-site vermiculite storage.

  Vermiculite was observed at several locations within the park: notable amounts were observed on the southwest side embankment and at the bottom of the embankment on the east side of Highway 37.

  Soil sampling activities included both surface and subsurface test pit samples. A total of 19 surface soil samples were collected. All surface samples were either 4- or 5-point composites from the 0- to 6-inch depth interval.

  Twelve test pits were excavated and subsurface sampled. Grab samples were collected at depths ranging from 12 to 39 inches bgs. PLM analytical results indicated that LA was present in nine of the 26 surface soil samples at levels ranging from trace to <1%, and in three of the 18 subsurface soil samples at trace levels.

- **Area 2 Removal Event – October/November 2003.** Within Riverfront Park, soil was excavated to a depth of 12 inches bgs throughout the park area, with the exception of the Kootenai riverbank and the northeast side of City Service Road where soils were excavated to a depth of 6 inches bgs. Excavation of the embankment on the southeast side of City Service Road was not conducted. Additionally, where visible vermiculite was observed or where elevated LA analytical results were detected above EPA's removal clearance criteria, additional 6-inch lifts were removed, iteratively, to a maximum depth of 3 feet bgs. However, along the riverbank and City Service Road embankment, maximum excavation depths were 12 inches bgs.

Fifty-nine, 5-point composite confirmation soil samples were collected at depths ranging from 6 to 36 inches bgs. Analytical results for the samples were either ND or <1% LA by PLM, with the exception of one sample, which was 2% LA, prompting removal of an additional 6-inch layer of soil. Analytical results for the subsequent excavation were <1% LA.

As a visual barrier, orange snow fencing was placed at the excavation floor. The area was restored to original grade using materials from the Boothman Pit and hydroseeded.

A new boat ramp was installed downstream of the existing boat ramp. The removal contractor (RC), Environmental Restoration, obtained riprap from the USACE Fisher River Road pit, which was placed along the toe of the bank.

- **Other Area 2 Activity – July 2007.** Subsurface vermiculite was brought to the surface during the installation of cable by a phone company from a depth of approximately two feet bgs. The excavated soils were disposed of at the former Libby vermiculite mine. The area was covered with four to six inches of rock.

- **Area 2 Investigation Sampling – September 2007.** Nine, 30-point composite surface samples were collected. All analytical results were ND for LA.

  A total of 270 point inspections for visible vermiculite were made. Vermiculite was not observed at 242 (89.6%) of the point inspections. Low levels of vermiculite were observed at 28 (10.4%) of the point inspections.

- **Area 2 Quick Response Removal Event – May 2008.** Soils were excavated to place foundation footings and a full concrete slab in the construction of a new City pavilion. The footings area was excavated to an approximate depth of 57 inches bgs. The excavated soils were disposed of at the former Libby vermiculite mine. The second area was excavated to provide a construction access ramp to the bottom of the City pavilion excavation. Restoration activities were performed by the City using 3 inches of common fill.

- **Area 2 Quick Response Removal Event – July 2008.** Several small areas containing medium to high amounts of vermiculite as well as what appeared to be raw LA were found. The type of vermiculite observed was apparently not from a local source, but was suspected as an import. No vermiculite was observed in these areas after the removal was completed.

2.1.3 Embankments Area 3

- **Area 3 Embankment Investigation Activities – September 2007.** Twenty-two, 30-point composite surface samples from 0-6 inches bgs were collected. Analytical results by PLM indicated 19 samples as ND, two as trace, and l as <1% of LA.

  Fifteen grab soil samples were collected from 0 to 24 inches bgs. PLM LA analytical results ranged from ND to trace and vermiculite was not observed in any of the samples.

  A total of 660 point inspections for visible vermiculite were made. Vermiculite was not observed at 584 (88.5%) of the point inspections. Low levels of vermiculite were observed at 58 (8.8%) of the point inspections; medium levels were observed at 14 (2.1%); and high levels of vermiculite were observed at 4 (0.6%) of the embankment point inspections.

2.1.4 Other OU1 Investigation Activities

- **OU1 Ambient Air Sampling– October 2006-2007 and November/December 2007.** A total of 143 outdoor ambient air samples were collected from four property address locations: 1915 Kootenai River Road, 247 Indian Head Road, Mineral Avenue, and 1427 Highway 37 (J. Neils Park). Analytical results by TEM for LA ranged from ND to 0.00016 s/cc, with an average concentration of 0.00001 s/cc. Thirty-two results were above the average and the remaining 111 results were below the average.

2.2 ROD Requirements

This section describes the RAOs and Selected Remedy for the OU1 site.

2.2.1 Remedial Action Objectives

RAOs are media- and source-specific goals to be achieved through completion of a remedy that is protective of human health and the environment. These objectives are typically expressed in terms of the contaminant, the concentration of the contaminant, and the exposure route and receptor. They provide the basis for determining whether protection of human health and the environment is achieved for the selected remedy. RAOs for OU1 were developed by evaluating several sources of information, including results of the risk assessments conducted as part of the OU1 RI Report (EPA 2009a) and current and future land use of the site.

Based on determinations of human health risks (EPA 2009b), LA in vermiculite and/or soil was likely to pose a current exposure risk to human receptors through inhalation of fibers released during active soil disturbance activities and inhalation of fibers in outdoor (ambient) air. It was expected that any risk from potential future disturbances that would expose subsurface, LA-containing soil might be substantially higher than under the current conditions prior to the RA. Site conditions are such that surface soils have either been capped or else removed and backfilled with clean soil as per the established removal clearance criteria for the RA.

The current and anticipated future land uses for the site were an important consideration for the development of RAOs to ensure remedial alternatives are protective of human health and the environment. Area 1 is owned by the City and a City park development is proposed for the majority of this area. Area 2 (Riverfront Park) is also owned by the City and used by the public. Area 3 consists of Highway 37 and City Service Road eastbound embankments, maintained by the MDT and the City, respectively, with no known current plans to disturb the in-place soils. The northwest corner of the site is currently occupied by the David Thompson Search and Rescue building.

The RAOs for the site presented below were based on anticipated future recreational, commercial, and/or light industrial use of the site:

1. Break the exposure pathways for inhalation of LA fibers that would result in unacceptable cancer risk or non-cancer hazard.

2. Control erosion of contaminated soil by wind and water from source locations to prevent exposures and the spread of contamination to unimpacted locations.

3. Implement controls to prevent uses of the site that could pose unacceptable risks to human health or the environment or compromise the remedy.

At a typical site, RA is required when contamination poses cancer risks that exceed 1 in 10,000 (or 1E-04) (EPA 2010). The RAOs for OU1 addressed LA contamination that poses cancer risks in the ranges between 1 in 10,000 and 1 in 1,000,000 (1E-06). Remedial goals (RGs) are typically used to guide such RA. RGs are defined as the average concentration of a chemical or a contaminant in an exposure unit associated with a target risk level such that concentrations at or below the RG do not pose an unacceptable risk. However, RGs were not developed for OU1, or the remainder of the Site (EPA 2010).

RGs are typically developed by computing the concentration of a contaminant in soil that corresponds to an excess cancer risk of 1E-04. However, such a computation is not possible at present because of the high variability in the relationship between asbestos in soil and asbestos in air. Even if the computations were possible, the ability to measure asbestos in surface and subsurface soil is presently limited by the available technologies and methods (EPA 2010). Additionally, noncancer risks from inhalation of asbestos fibers have also been recognized, but there is no current methodology to quantify noncancer risks for asbestos (EPA 2009b).

For these reasons, RGs for asbestos were not established for site soils. If the RAOs for asbestos contamination are achieved through implementation of the Selected Remedy, then risks to humans from inhalation exposures to asbestos are expected to be acceptable (EPA 2010).

2.2.2 Selected Remedy

As presented in the ROD for OU1 (EPA 2010), the Selected Remedy for remediation of asbestos-contaminated soil is a combination of Alternative 3b (In-Place Containment of Contaminated Soil, Removal of Contaminated Soil for Utility Corridors, Offsite Disposal, and ICs with Monitoring) and Alternative 4a (Partial Removal of Contaminated Soil, Offsite Disposal, and ICs with Monitoring). These removal and containment remedies will achieve all RAOs by eliminating current exposure pathways and monitoring to ensure that the remedy continues to protect human health and the environment. A summary of the Selected Remedies, as detailed in the ROD, is as follows:

- The majority of the remediation work will consist of containment via construction of soil covers to encapsulate areas of surface contamination. The FS anticipated that approximately nine acres of the site would be covered.
- Removal and offsite disposal of contaminated materials will be used in the proposed utility corridor areas. Flexibility to remove other areas of contamination is included to preemptively remove contaminated materials as land use issues develop.
- A visible marker layer will be placed at the bottom of the cover to denote the extent of the cleanup.
- Clean fill for excavations and construction of covers will be obtained from offsite subsoil and topsoil sources outside of the Libby valley. Final quantities will be evaluated in the design process.
- Removal and offsite disposal of contaminated materials will be used in the proposed utility corridor areas which are expected to encompass approximately 10 percent of Areas 1 and 2. Additionally, by adding Alternative 4a to the selected remedy, EPA obtains the flexibility to remove other areas of contamination that may need to be removed preemptively due to land use issues.

- Employ ICs to minimize risks posed to human receptors from remaining LA in subsurface soil by limiting uses that might create an exposure pathway or damage the remedy. EPA anticipates that ICs for OU1 will include governmental and/or proprietary land use restrictions, and informational devices. Governmental ICs, for example, may impose land or resource restrictions using government authority, such as building codes, permits, or zoning regulations that are administered by local agencies. Proprietary controls, either private, governmental, or a combination of the two, typically involve landowner agreements or easements that restrict certain activities on the property. ICs are considered an integral part of the remedy, so development and implementation of the ICs will be conducted as part of the remedial action.
- If needed, install engineered controls to warn the public and limit access to the site.
- Maintain the integrity of the selected remedy and monitor the remedy to ensure that the controls are effective.

Points of clarification presented in Section 14, Documentation of Significant Changes of the ROD are regarded as subcriteria for determining whether the remedy put in-place at OU1 meets the criteria for determination of operational and functional (O&F). The following is a summary of the points of clarification and the manner in which the EPA will address them:

- **Risk Assessment.** The EPA will conduct a quantitative, OU1 post-construction risk assessment, to include ABS, at OU1 following the completion of construction to confirm effectiveness of the remedy (EPA 2010). It is anticipated that risk assessment sampling activities will be conducted in summer 2013.
- **New Information.** When the site-wide risk assessment is complete, the agencies will re-evaluate the remedy in accordance with the review requirements at CERCLA Section 121(c). New information concerning toxicity factors will also be evaluated in five-year reviews. If unacceptable exposures are identified, the EPA will take action as necessary to ensure that the soil-to-air pathway is broken. Actions may include additional excavation, improving covers, and/or strengthening ICs. In addition, the EPA will conduct five-year reviews as part of the ongoing O&M of the remedy.
- **Planned Future Uses.** The EPA will work closely with the City during design so that design can complement any planned future uses.
- **Removal of Contamination at Depth in Excavations.** Encountered LA source materials during excavation activities will be removed to a maximum of 3 feet below finished grade. A visible barrier marking the extent of excavation will be placed at the bottom of the excavation before backfilling.

The implementation of the Selected Remedies is detailed in Sections 3 and 6.3 of this report. An evaluation of the performance of the Selected Remedies in terms of satisfying the RAOs is presented in Section 5.1.

2.3 Remedial Design

Subsequent to the ROD completion and preceding construction, the City retained a designer to develop the proposed park. RA design drawings (EPA 2011b) were prepared in response to the City's proposed design for this RA. Construction activities at the site were conducted in accordance with the Libby Site Response Action Work Plan (RAWP) (USACE 2010a), and the design drawings. OU1 remediation plans were prepared to supplement the RAWP and address OU1 site-specific remediation. During construction, modifications were made to these site-specific RAWP, as documented in Section 3 and the as-built drawings provided in Appendix B.

Section 3
Construction Activities

RA construction activities were conducted in accordance with the RAWP (USACE 2010) and design drawings (EPA 2011b). Construction activities included:

- Mobilization and Site Preparation;
- Excavation and Disposal of Contaminated Soil;
- Riverbank revetment;
- Boat ramp restoration;
- Backfill; and
- Erosion and stormwater control.

The following is a brief description of RA construction activities from mobilization through demobilization. RA construction as-builts and construction-related documents are provided in Appendices B and C.

3.1 Mobilization and Site Preparation

The mobilization and site preparation for this RA commenced on August 9, 2011 and followed the same progression as previous removal activities at the site. The necessary equipment including, but not limited to, a decontamination trailer, excavator, and potable and non-potable water tanks were mobilized to the site. The RC, PRI-ER, delineated the removal areas by removing the existing safety fence and replacing it with new orange fencing and yellow caution tape. The site was cleared of ground-cover vegetation to facilitate the surveying crew. U-Dig, the utility locate service, was contacted and utilities were marked within the work zone prior to excavation. Any hazards existing within the work zone were isolated or removed. RC and third-party quality assurance (TQA) personnel, CDM Smith, walked through the site during this set-up to ensure that each contractor had current copies of remediation designs (Appendix B) and concurred on project design objectives. Following this inspection, asbestos tape was added to the orange construction fencing to establish the removal areas as an exclusion zone. The RC collected pre-excavation photos to document current site conditions when the RC took control of the site.

3.2 Removal Activities

One of the main construction components of the RA was the excavation and offsite disposal of contaminated soil. OU1 is unique compared to the other Libby OUs in that finish grade was not pre-existing. The City proposed City park development for OU1. The City contracted with a designer, WGM Group, who provided site finish grades. These grades were used to determine depth of excavation across the site, based on a minimum 18 inch cover of import soil over native soils containing <1% LA. An additional 18 inches of soil was excavated for those areas with analytical results greater than or equal to (≥) 1% LA. The excavation area would be resampled and analyzed for informational purposes, i.e. soils with elevated concentrations ≥1% LA would have a minimum 36 inches cover of import soil.

Furthermore, an orange construction barrier was placed on the subgrade surface prior to import soil placement. The marker barrier was installed as a visual means of identifying the interface between native and import soils.

A comprehensive excavation plan was created and represented in the field using a 25 feet on-center alpha-numeric grid system. Each grid intersecting point had a construction stake with elevation information that the excavation operators and soil sample technician could spatially reference on the plans.

A total of 25,656 cubic yards (cy) of contaminated soil was removed from OU1 and disposed of at the former vermiculite mine. Volume of soil removed was not tracked separately by area because areas were excavated concurrently. Specific removal activities by area are described in the following subsections.

3.2.1 Excavation of Contaminated Soil

3.2.1.1 Area 1

Site preparation activities began August 17, 2011 with removal of existing railroad structures, a loading ramp and railroading siding, which were contained within the exclusion zone. Prior to intrusive excavation, these structures were removed, decontaminated, and staged for the City's off-haul by the RC.

Site removal activities began on September 30, 2011. Excavation began east of and at the northeast corner of the David Thompson Search and Rescue parking area and adjacent to the south edge of pavement of City Service Road and proceeded east. Two additional excavation crews began south of and adjacent to the first excavation crew, working in an easterly direction. When each excavation crew completed excavation to final depth and to the easterly limits of construction, the crews would relocate to the westerly limits of excavation south of the just completed section and begin excavating anew in the same manner. This facilitated disposal trucks access to the site and to the excavation crews traveling on imported laydown soil, mitigating cross-contamination.

Area 1 excavation activities were completed for the 2011 construction season on October 24, 2011 at the southeast corner of the site. On October 29, 2011, excavation activities were completed at the proposed detention basin for future stormwater control. No further intrusive work was conducted for the remainder of 2011.

A cooperative agreement was reached between the City and the EPA for a new City sanitary sewer line where City employees would construct the entire system and the RC would only be responsible for transportation related activities, disposal of excavation spoils at the mine, and the final 12-inch trench backfill section. Sanitary sewer trench construction began May 10, 2012 at the existing sanitary sewer manhole north of and adjacent to the northwest corner of the David Thompson Search and Rescue building and progressed 356 feet to the southeast and 338 feet to the southwest. The new sanitary sewer system was completed May 30, 2012.

On June 8, 2012, removal activities reconvened with the final excavation of Area 1 at City Service Road. In accordance with the design drawings; City Service Road asphaltic concrete (AC) removal was staged where the westbound lane was first removed in order to maintain one-way traffic on the eastbound lane. AC removal began adjacent to the David Thompson Search and Rescue building and progressed east. When the westbound AC was removed, the same process was employed for the eastbound lane. AC removal was completed on June 12, 2012 and the roadway base section excavation

began at the easterly limits on June 13, 2012. The roadway base section excavation was completed on June 15, 2012. The roadway was realigned and replaced with crushed rock as discussed in Section 3.3.

3.2.1.2 Area 2

On February 28, 2012 the RC mobilized to the site to begin work in Area 2 to reinforce the existing deteriorated revetment along the south river bank of the Kootenai River, beginning just east of the gravel boat ramp and extending just west of the concrete boat ramp. Clearing and grubbing preceded rip rap placement. Rip rap placement followed the proposed design with D85-D100 sized rock submerged to establish the toe of slope within the river bottom, where D85 and D100 are the rock sizes that correspond to 85% and 100% of the sample passing by weight. Following the toe of slope establishment, USACE Class V rock was placed on the embankment toe and continued upslope to the top of the embankment. A total of 3,850 tons of rock were placed as part of the revetment. Revetment placement was completed March 13, 2012, though some minor hand work continued the following day to chink voids and ensure three-point contact on unstable rocks.

Subsequent to the revetment construction, the new Armorflex™ mat boat ramp construction began May 30, 2012 with the excavation at the existing concrete ramp's toe of slope. A Portland cement concrete pad was placed in advance of the proposed boat ramp surface which was completed June 12, 2012. Work resumed at the boat ramp on June 18, 2012 to install the Armorflex™ mat. The Portland cement concrete anchors for the boat ramp were poured on June 19, 2012 and surrounding area along the embankment was dressed with rip rap which was completed August 10, 2012.

3.2.1.3 Area 3

The RC began excavation at Area 3 concurrent with the Search and Rescue parking area excavation, at Highway 37 west embankment on August 18 and completed August 25, 2011. The embankment soil was excavated to a depth of approximately 6 inches bgs. On August 19, 2011 the RC began the 6-inch excavation of the City Service Road south embankment in Area 3. Uniform removal of contaminated soil to approximately 6 inches bgs was excavated in the two discrete locations of Area 3 on both east and west embankments of Highway 37, north of City Service Road. Excavation began on April 19, 2012 at the east embankment followed by the west embankment which was completed on April 26, 2012.

3.2.2 Offsite Disposal of Contaminated Soil

As specified in the Selected Remedy, the contaminated soils were excavated and hauled to the former vermiculite mine for offsite disposal. All haul trucks and trailers working on the Libby project were required to have water-tight beds. These sealed beds allowed water conditioned soil, for the purpose of fugitive dust mitigation, to be placed in the bed of the dump truck without leaking contamination. In addition, all trucks and trailers used tarps secured over the top of the bed to mitigate fugitive dust during transport. To prevent contamination of the interior of the truck, a negative air system maintained positive pressure in the cab of the truck while in excavation areas and traveling on the mine road. These trucks and trailers delivered material to an area along the mine road called the amphitheater and then underwent a thorough decontamination before leaving the mine. Soil was taken from the amphitheater by mine-designated vehicles to areas farther up the mine road for disposal.

3.2.3 Confirmation Soil Sampling

Confirmation composite soil samples were collected from the bottom of discrete excavated areas, in sizes no larger than 2,500 square feet by combining the 25-foot excavation grid system into 50-foot cells. These samples were collected, handled, and analyzed in accordance with the Response Action Sampling and Analysis Plan (EPA 2011c). The sample depths for confirmation soil samples were measured from original ground surface to the excavation floor. Sample depths typically ranged from 18 to 36 inches bgs across the site.

A total of 241 confirmation soil samples were collected and analyzed throughout the duration of the RA. Samples were 30-point composites and were generally collected from the 18 to 20-inch depth interval. A 30-point inspection for visible vermiculite was also performed in each sampled area to ensure clearance removal protocols were achieved. The analytical results for these samples ranged from ND to 5% LA by the NIOSH PLM 9002 method (NIOSH 1994a). A total of eight out of the 241 samples had results ≥1% LA. Figures 3-1 through 3-4 show the confirmation sample areas beneath the engineered cover at which residual contamination may be encountered across OU1. Sample results are provided in Appendix C.

3.3 Backfill, Compaction and Placement of Cover

All backfill materials were sourced from borrow areas at Ward Pit, Noble Pit, Nickelback Pit, USACE Fisher River Rip Rap Pit, Wolf Creek Rip Rap Pit, Libby City/County Pit, Granite Pit and Chapman Pit outside of the Libby valley and were tested prior to placement. As detailed in the RAWP (USACE 2010a), backfill materials were tested to ensure that they are both within specifications for the respective fill type and that they were not contaminated with LA.

Per the RAWP and design drawings, a visible marker layer was placed at the bottom of the excavation prior to backfill. Orange construction fence was placed directly upon the finished subgrade prior to placing import soils.

The project comprised of six typical cross sections with varied soil types and thicknesses depending on the areas' designed uses. The sections ranged from structural road section to landscaping. Soil was nominally placed in 8-inch lifts and dynamically compacted to the designed relative compaction specification and elevation. Three types of import soil were used for cover material; common fill (7,377 cy), ¾-inch-minus crushed base (6,581 cy), and top soil (4,024 cy). The City Service Road was realigned and replaced with a minimum 8-inch thick sub-base using 3-inch minus crushed rock, followed by a 10-inch layer of ¾-inch minus sub-base coarse. Details of the cross sections are shown in the OU1 as-built drawings provided in Appendix B.

Restoration activities began with the placement of the visual barrier on October 4, 2011. Import soil placement and compaction began on October 7, 2011 and the visual barrier placement advanced ahead of soil placement across the site. Site soil cover placement was completed on June 29, 2012.

3.4 Erosion and Stormwater Control

All excavated areas were either hydroseeded (272,592 ft²) by a landscape contractor or received a structural base material (167,328 ft²) to stabilize the surface soils from erosion. Erosion matting (35,856 ft²) was also placed on the embankment areas that were excavated. Structural base material placement was staged as part of the import soil placement, hydroseeding, and tree planting which was completed on June 29, 2012. Drainage features were also incorporated into the design in the form of

swales discharging into trench drains and sumps to manage stormwater runoff. These measures will help to ensure that the Selected Remedy remains protective of human health and the environment. Ongoing O&M includes routine visual inspections of the erosion control materials and communication with the City on work in and around OU1.

Construction as-builts for OU1 are presented in Appendix B.

3.5 Demobilization

Equipment used during construction activities was decontaminated, as necessary, and demobilized from the site as soon as that particular piece of equipment was no longer needed. As a result, demobilization from OU1 occurred throughout RA construction activities. The final demobilization date was June 29, 2012, as documented in the QAR in Appendix D.

3.6 Design Modifications During Construction

During the removal and restoration activities, unforeseen conditions were encountered and design revisions were made. Consequently, forty design modifications were made over the course of the project. Design modifications were executed by the RC in real time with no delay impact to the project. Some of the major modifications are as follows:

- Mod #6: increased the thickness of the road-base materials from 6 inches of ¾-inch minus base to 10 inches of ¾-inch minus crushed base course;
- Mod #18: as indicated on the as-builts, marker barrier was placed in limited areas of the David Thompson Search and Rescue parking area in accordance with an earlier revision of the design documents;
- Mod #19 and #21: modified the excavation depths to avoid damage to shallow utilities;
- Mod #24: replaced 8 inches of common fill with 6 inches of topsoil on embankments; and
- Mod #40: Enlarged two rock trench drains along western boundary of Area 1.

The Change / Modification log and copies of the modifications are found in Appendix E.

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Section 4
Chronology of Events

This section presents a tabular summary that lists the major events for the Site OU1 RA project and associated dates of these events beginning with the ROD signature. See Section 2.1 for a summary of all investigation and removal activities that occurred prior to the ROD.

Date	Event
May 10, 2010	ROD for OU1 Signed
August, 2011	Remedial Design Complete
August 9, 2011	Mobilization and Site Preparation
August 16, 2011	Start of Excavation
March 13, 2012	Area 2 River Bank Revetment Complete
April 26, 2012	Area 3 Remedial Excavation Complete
June 15, 2012	Area 1 Remedial Excavation Complete
June 29, 2012	Area 1 Remedial Restoration Complete
June 29, 2012	Area 3 Remedial Restoration Complete
August 8, 2012	Joint Site Inspection
August 10, 2012	Area 2 Boat Ramp Restoration Complete
August 10, 2012	Final Restoration Inspection
October 3, 2012	Construction As-Builts Submitted to City
TBD	O&M Plan Approval
Summer 2013	OU1 Post-Construction Risk Assessment Sampling
TBD (estimated Summer 2014)	First Annual Site Inspection
TBD	Institutional Control Implementation and Assurance Plan (ICIAP) Approval
TBD	OU1 Post-Construction Risk Assessment Report
TBD	Site-wide Risk Assessment Report
TBD	O&F Determination/Start of O&M Phase
TBD	First Annual O&M Site Inspection
TBD	First Annual O&M Report
TBD	First Five-Year Review

TBD – to be determined

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Section 5

Performance Standards and Construction Quality Control

This section describes the overall performance of the removal and containment remedy in terms of comparison to the OU1 site remedial action objectives. In addition, this section discusses the remedy performance monitoring strategy and QA/QC procedures followed.

5.1 Comparison to RAOs

The RAOs for the OU1 site are presented in Section 2.2.1. This section presents a brief summary of the current conditions as compared to the RAOs. Upon completion of the OU1 post-construction risk assessment, the EPA will verify that all RAOs are still met.

The confirmation soil sample analytical results from the removal activities indicate that the majority of the site's exposed finish subgrade is at concentrations <1% LA. Figure 3-1 shows the concentrations and depths of LA remaining across all of OU1. In the areas with residual contamination, the in-place cover is sufficient to break the exposure pathway. This accomplishes the RAO of mitigating the potential for inhalation exposure to asbestos fibers that would result in risks that exceed the target cancer risk range of 1E-06 to 1E-04. However, the EPA will conduct a post-construction risk assessment at OU1.

Restoration activities at OU1 included placement of cover and seeding or re-vegetation, and in some cases, placement of rip-rap and/or erosion control matting. These measures address the second RAO to control erosion of contaminated soil by wind and water from source locations to prevent the spread of contamination to unimpacted locations. Section 7 provides a brief description of OU1 O&M measures in place to ensure that the Selected Remedy remains protective of human health and the environment.

The final RAO to implement controls to prevent uses of the site that could pose unacceptable risks to human health or the environment or compromise the remedy will be addressed by the implementation of ICs for OU1. An Institutional Control Implementation and Assurance Plan (ICIAP) will be developed to address implementation and periodic review of the specific IC instruments for OU1. This is discussed further in Section 6.3.

5.2 Remedy Performance Monitoring Strategy

The ROD included monitoring as a component of the Selected Remedy to ensure long-term effectiveness and permanence. The remedy performance monitoring strategy includes inspections and reviews (EPA 2011c). During the site inspections, current site conditions – including drainage, signs of erosion and integrity of the cover – will be observed and documented. Monitoring of the ICs will include evaluations of the effectiveness of the ICs implemented by the ICIAP. Section 7 provides a brief description of OU1 O&M measures in place to ensure that the Selected Remedy remains protective of human health and the environment.

Five-year site reviews will be conducted by the EPA (as required by the National Oil and Hazardous Substances Pollution Contingency Plan due to contamination left-in-place) to ensure that the remedy as implemented and maintained continues to be protective of human health and the environment.

5.3 Construction QA/QC

During RA construction, TQA personnel were tasked with documenting if construction activities were performed in accordance with the RAWP and design drawings. TQA personnel recorded observations on a daily basis in the QARs. Deviations from the guidance documents were recorded in the Change / Modification log discussed in Section 3.6. Upon completion of construction activities, the restoration final inspection (RFI) was conducted. TQA and RC staff walked through the site on August 10, 2012 to determine if the scope had been completed in a satisfactory manner. This inspection, which did not identify any deficiencies, was noted in the QAR provided in Appendix D.

A joint site inspection (JSI) by the EPA, DEQ, RC, and TQA representatives also occurred on August 8, 2012. A detailed account of these QA/QC assessments is presented in Section 6.1.

5.4 QA/QC Procedures

QA/QC measures for this remedial action included, but were not limited to, appropriate training of sampling and inspection personnel, the collection of field QC samples (such as duplicate soil samples and field blanks), implementation of a laboratory QA program (implemented for the entire Site), review of this report by an approved CDM Smith QA staff member, and audits to evaluate adherence to project requirements and procedures outlined in relevant site guidance documents.

Section 6

Final Inspections and Certifications

6.1 Remedial Action Contract Inspections

This section provides a description of all contract inspections, including field audits, the RFI and the JSI.

6.1.1 Field Audits

Daily field audits, or follow-on inspections, were performed by the TQA. The RAWP (USACE 2010a) required that these inspections be conducted at least once per day at each work site for each phase of work. Work practices, compliance with plans and specifications, compliance with safety, and efficiency were reviewed and recorded on the daily QAR. Any deficiencies noted were immediately communicated to the task foreman for resolution.

All RA construction activities were conducted in accordance with the RAWP and design drawings. No major deficiencies were identified during the daily audits. All QARs for the remedial action are provided in Appendix B.

6.1.2 Restoration Final Inspection

The Restoration Final Inspection was conducted on August 10, 2012 following the completion of restoration activities (with the exception of hydroseeding near the boat ramps, which was not completed until August 14, 2012.) This inspection provided an opportunity for the City, RC, and TQA to meet onsite and identify any non-conformance with the work plan. In this case, no deficiencies were identified by the City, RC, or TQA. This RA was completed in accordance with the RAWP and design drawings.

6.1.3 Joint Site Inspection

Representatives from the EPA, DEQ, RC, and TQA met at the site on August 8, 2012 to conduct a JSI. The results of this inspection were reported in the OU1 JSI Memorandum (CDM Smith 2012). This type of inspection is typically conducted at the conclusion of construction at a given site and is required before an O&F determination can be made.

During the JSI, attendees observed current site conditions and reviewed previous remediation/restoration activities. Attendees agreed that construction activities were completed in accordance with the Selected Remedy outlined in the OU1 ROD, RAWP and design drawings. However, due to the current lack of toxicity data for LA, an O&F determination was not made and, as agreed by JSI attendees, will be deferred until the OU1 post-construction risk assessment sampling is completed. A copy of the JSI Memorandum is provided in Appendix F.

6.2 Health and Safety

All activities conducted at the Site are subject to conformance with the Comprehensive Site Health and Safety Plan (CHASP) (CDM Smith 2011). Included below is a brief description of significant health and safety measures implemented during the RA. For details, reference the CHASP.

During construction, water-based dust suppression was used to prevent asbestos fibers from becoming airborne. This alleviates cross-contamination concerns by preventing offsite migration of fibers. Also, dust suppression provides additional respiratory protection for laborers working within the contaminated areas. To prevent migration of fibers during transport, containerized truck beds and trailers are used.

During the RA, all personnel on site used proper personal protective equipment (PPE), as documented in the QARs. A minimum of modified level D was worn on the site at all times, including safety shoes, safety glasses, and hardhats. Personnel entering the exclusion zone wore modified level C, including safety shoes, safety glasses, disposable coveralls, hardhats, and half or full face respirators (depending on intrusiveness of activity). Personnel exiting the exclusion zone went through a thorough decontamination process in the shower trailer located in the contamination reduction zone. Additionally, the clean room of the decontamination shower trailer was regularly monitored for potential LA fiber migration, with all 12 ambient air samples ND for LA by TEM (see Appendix C).

Perimeter air samples were collected from the downwind side of excavation areas during all removal activities to monitor for offsite migration of LA. All of these air samples were ND for LA by TEM. Results of the perimeter air samples are included in Appendix C. The CHASP also requires bi-annual personal air monitoring for operators and laborers performing removal activities; however, this is a site-wide requirement that was also satisfied at other locations on the Site. For the 13 personal air monitoring samples collected for OU1 site workers during RA activities, PCM results indicate levels within OSHA permissible exposure limits (see Appendix C).

6.3 Institutional Controls

ICs are non-engineering measures designed to prevent or limit exposure to hazardous substances left in place at a site, or assure effectiveness of the chosen remedy. ICs currently in-place at OU1 include:

1. One Call Locate Center – Any excavation requires a call to Montana's One-Call underground facility location service (U-Dig) for Lincoln County to identify the potential for buried facilities. For an excavation within the Superfund Site boundary, a call to U-Dig also prompts the Environmental Resource Specialist (ERS) program to identify the potential for residual asbestos contamination on the property.

2. Permit - Any excavation within the MDT right of way requires a permit from MDT. That permit includes information about the potential to encounter asbestos contaminated soil.

The EPA is also evaluating further proprietary/legal controls for each portion of the OU. All final ICs for OU1 will be compiled in the ICIAP.

Once established, the ICs will be evaluated and updated on an annual basis by DEQ. DEQ will conduct this work under the Cooperative Agreement, if amended, and following entry into the O&M period. The evaluation will assess whether the selected IC instruments remain in place and whether the ICs are enforced such that they meet the stated objectives and performance goals and provide protection

required by the response. Five-year site reviews performed by the EPA will also periodically evaluate the effectiveness of the ICs as they are implemented and maintained.

The following are the IC categories. For more information on these ICs, refer to the ICIAP (EPA 2012a). The ICIAP identifies the specific IC instruments implemented for the Selected Remedy.

- **Proprietary Controls** - Proprietary controls have their basis in real property law and generally create legal property interests (EPA 2000a). Potential IC instruments considered for this remedial action in the OU1 ROD include an environmental covenant, easement, or deed notice.
- **Governmental Controls** – Government controls impose restrictions on land use or resource use, using the authority of a government entity (EPA 2000a). All future land use is anticipated to be residential and/or commercial.
- **Informational Devices** – Informational devices could provide information or notification to local communities that residual or contained contamination remains on site (EPA 2000a). The EPA anticipates that an important component of the informational devices will be an agreement with the utility-locate service, U-Dig, to add areas of subsurface contamination to their database of underground hazards.
- **Enforcement and Permit Tools** – Enforcement and permit tools are legal tools, such as administrative orders, permits, Federal Facility Agreements (FFAs) and Consent Decrees (CDs), that limit certain site activities or require the performance of specific activities (EPA 2000a). The establishment of enforcement and permit tools is not anticipated at the time of the development of this report.

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Section 7

Operation and Maintenance Activities

This section summarizes the general activities for post-construction operation and maintenance. This section also summarizes re-evaluations that will ensure that the Selected Remedy remains protective taking into account future risk assessment data. Detailed information regarding operation and maintenance for the OU1 site is provided in the Draft O&M Plan (EPA 2013).

7.1 Long-Term O&M Activities

Long-term O&M will be performed to maintain the integrity of the remedy components, including protective covers and ICs, after OU1 is determined to be operational and functional. The O&M Plan will define the responsibilities for long-term O&M of the remedy and repairs. The following subsections summarize what will be considered routine O&M activities.

7.1.1 Routine Site Inspections

Routine non-intrusive visual site inspections will be conducted to ensure integrity of the covers and backfilled areas. OU1 site inspections are assumed to be performed at least annually as well as concurrently with the five-year site review.

7.1.2 Cover Maintenance

The main concern during the O&M period will be future encounters with contaminated soil resulting from damage to the remedy. Damage to covers and backfilled areas identified during routine OU1 site inspections will be repaired to eliminate exposure of underlying contamination. Issues that may arise with the covers during long-term O&M and contingency plans for such occurrences are detailed in the Draft O&M Plan.

7.1.3 U-Dig Review

U-Dig call data will be evaluated for accuracy and validity as calls are received to ensure protectiveness. Evaluation of U-Dig calls is discussed in the OU1 O&M Plan.

7.1.4 IC Evaluation and Updates

ICs will be evaluated on at least an annual basis and updated if necessary to ensure protectiveness. Evaluation and updates for different types of ICs are discussed in the OU1 O&M Plan.

7.1.5 Reporting

Routine reports summarizing O&M activities will be prepared by the DEQ and submitted to the EPA on an annual basis. Routine reporting also involves regular review and updates as necessary to the O&M Health and Safety Plan (HASP). Reporting requirements are discussed in the OU1 O&M Plan.

7.2 Five-Year Reviews

Five-year site reviews of the OU1 site will be performed since contaminated subsurface soil is left in place below the protective covers and backfilled excavations, preventing unrestricted use of the OU1 site. The EPA is responsible for performing and funding the five-year reviews as long as they are required.

The five-year review process consists of six components: 1) community involvement and notification; 2) document review; 3) data review and analysis; 4) site inspection; 5) interviews; and 6) protectiveness determination (EPA 2001), (EPA 2003).

- Community involvement activities will notify the public that the five-year review will be conducted, that it has been completed, and that results are available for review at the EPA Information Center in Libby.
- Document review involves an evaluation of all relevant documents and data to obtain information to assess the performance of the remedial action.
- Site inspections will be conducted to gather information about the site's current status and to visually confirm and document the conditions of the remedy, the site and the surrounding area.
- Interviews may be conducted as necessary with the site manager, site personnel and people who live or work near the site to gather additional information about the site's status or to identify remedy issues.
- The protectiveness determination should include a technical assessment of the following questions:
  - Is the remedy functioning as intended by the decision documents?
  - Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?
  - Has any other information come to light that could call into question the protectiveness of the remedy?

7.3 OU1 Post-Construction Risk Assessment Re-Evaluation

When the OU1 post-construction risk assessment is complete, the EPA will re-evaluate the remedy to confirm its effectiveness. If unacceptable exposures are identified, the EPA will take action as necessary to ensure that the soil-to-air pathway is broken. Actions may include additional excavation (to a maximum of 3 feet), improving covers, and/or strengthening ICs. If contamination continues below 3 feet, a visible barrier marking the extent of excavation will be placed before backfilling.

Section 8

Summary of Project Costs

Consistent with EPA guidance (EPA 2000a), a summary of project costs is provided within this RA report. According to the guidance, the total project costs are to be compared to the estimates presented within the ROD. It should be noted that this section provides project costs for the 2011/2012 remedial action only. The costs associated with previous removal actions are not considered because those removal actions were conducted under Comprehensive Environmental Response, Compensation, and Liability Act removal authority rather than remedial authority.

All capital costs in the comparison table below are reported in the same dollar basis as the actual project costs (i.e., 2012 dollars). The capital costs projected in the ROD were escalated to 2012 dollars using the USACE Civil Works Construction Cost Index System (USACE 2012). Because O&M costs have not been incurred and will not be compared, the ROD projections for annual O&M costs and periodic costs remain in 2010 dollars. Appendix A provides a summary of actual capital costs associated with construction activities (earthwork).

	Projections in ROD	Actual Costs
Capital Cost (ICs and Engineered Controls)	$61,000	Not yet incurred
Capital Cost (Earthwork)*	$3,467,000	$2,813,190
Annual O&M Cost and Periodic Cost (Five-Year Reviews)	$955,000	Not yet incurred

*ROD projections escalated to 2012 base year

The incurred total capital costs associated with the RA were less than projected in the ROD. In large part the reduction in cost is due to cost savings in technical support which included remedial design, project management, and construction management. The cost estimate for the preferred alternative assumed approximately $880,000 (escalated to 2012 base year) for technical support. The technical support costs for the preferred alternative were based on EPA guidance for estimating indirect costs (EPA 2000b) using percentages applied to the total estimated construction costs. As shown in Appendix A, only $383,025 was spent on technical support. However, the actual technical support costs do not include costs incurred by the EPA and USACE.

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Section 9

Observations and Lessons Learned

This section provides observations and lessons learned from implementation of the Libby OU1 RA construction activities including successes, problems encountered, and resolutions.

9.1 Successes

OU1 posed a unique relationship with the City, relative to the other OUs, where the City retained a designer to develop and propose the park finish grade elevations and features. The USEPA established removal and restoration limits based on the City's proposed final grade elevation. This approach required significant City involvement and participation in finalizing plans prior to and managing modifications during construction. A City council representative was delegated as the point of contact and responsible for conveying project issues to their designer. The request for information, design modifications, and material submittal approval processes went smoothly with no impact to construction schedule.

The greater majority of other OU protocols was to uniformly remove contaminated soil to a specified depth below original grade and restored in kind. Because OU1 proposed finish grade elevations varied across the site the depth of excavations likewise varied accordingly. Subsequently, a staked grid of 25-feet on-center was surveyed and each point stake was labeled with depth of excavation. The excavator operators interpolated between stakes to establish proposed topography. The system proved effective to achieve proposed depth of excavation and mitigate unintended over-excavation while achieving the minimum 18 inches of imported soil cover.

Due to the OU1 areal expanse, over 200 confirmation soil samples were anticipated. The USEPA requested laboratory analysis on a 24-hour turn-around basis to accommodate the fast-track removal process. When analytical results exceeded 1% LA, the excavation crews were able to efficiently and effectively return to those discrete polygon removal areas to over-excavate without cross-contaminating cleared polygons. This protocol required a number of individuals and systems to closely communicate and coordinate.

9.2 Problems Encountered and Resolutions

The EPA was evaluating and adjusting restoration materials sections to maximize cost efficiency. Consequently, at other OUs, the top soil section was revised from 6 inches to 4 inches. However, during OU1 embankment restoration, it was determined that the 4-inch section was insufficient for grass seeds to substantially establish. Therefore, 6 inches of top soil was restored to the OU1 embankments.

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Section 10

Libby OU1 Contact Information

Contact information for the key OU1 RA project personnel is presented below.

Name	Title	Organization	Contact Information
Dania Zinner	Remedial Project Manager	EPA Region VIII	1595 Wynkoop Street, 8EPR-SR Denver, CO 80202 (303) 312-6552 zinner.dania@epamail.epa.gov
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Section 11

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Appendix F

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Libby Asbestos Superfund Site
The Former Export Plant Site,
Operable Unit 1
Lincoln County, Montana

Final Remedial Action Report

USACE Contract No. W9128F-11-D-0023

Task Order No.: 0003
EPA RPM: Dania Zinner

June 25, 2013

Prepared for:
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Libby Asbestos Superfund Site
The Former Export Plant Site,
Operable Unit 1
Lincoln County, Montana

Final Remedial Action Report

USACE Contract No. W9128F-11-D-0023
Task Order No. 0003

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Abbreviations and Acronyms

AC	asphaltic concrete
ABS	activity-based sampling
AHERA	Asbestos Hazard Emergency Response Act
bgs	below ground surface
BNSF	Burlington Northern Santa Fe
CDM Smith	CDM Federal Programs Corporation
CHASP	Comprehensive Site Health and Safety Plan
City	City of Libby
cy	cubic yards
DEQ	Montana Department of Environmental Quality
ERS	Environmental Resource Specialist
FS	feasibility study
f/cc	fibers per cubic centimeter
ft^2	square foot
GPI	general property investigation
GPS	global positioning system
Grace	W.R. Grace and Company
HASP	Health and Safety Plan
IC	institutional control
ICIAP	Institutional Control Implementation and Assurance Plan
ISO	International Organization for Standardization
LA	Libby amphibole asbestos
JSI	joint site inspection
MDT	Montana Department of Transportation
ND	non-detect
NIOSH	National Institute for Occupational Safety and Health
O&F	operational and functional
O&M	operations and maintenance
OU	operable unit
PCM	phase contrast microscopy
PLM	polarized light microscopy
PPE	personal protective equipment
PRI-ER	Project Resources, Inc – Environmental Restoration, Joint Venture
QA	quality assurance
QAR	Quality Assurance Report
QC	quality control
RA	remedial action
RAO	remedial action objective
RAWP	Response Action Work Plan
RC	removal contractor
RG	remedial goal
RI	remedial investigation
ROD	Record of Decision
ROW	right-of-way
s/cc	structures per cubic centimeter
s/cm^2	structures per square centimeter
	Libby Asbestos Superfund Site

Site	Syracuse Research Corporation
SRC	transmission electron microscopy
TEM	third party quality assurance
TQA	U.S. Army Corps of Engineers
USACE	
≥	greater than or equal to
<	less than
%	percent

Section 1
Introduction

1.1 Site Name and Location

The Libby Asbestos Superfund Site (Site) (CERCLIS # MT0009083840) is located in and around the City of Libby (City), Montana. Libby is the county seat of Lincoln County and lies in the northwest corner of Montana, about 35 miles east of Idaho and 65 miles south of Canada. The Site is divided into eight operable units (OUs) (Figure 1-1).

OU1 encompasses an area of approximately 17 acres and is situated on the south side of the Kootenai River, just north of the downtown area of Libby, Montana. The property is bounded by the Kootenai River to the north, residential property to the east, the BNSF railroad thoroughfare to the south, and State of Montana property to the west (Figure 1-2).

The OU1 site was historically owned and used by W. R. Grace and Company (Grace) for stockpiling, staging, and distributing vermiculite and vermiculite concentrate to vermiculite processing areas and insulation distributors outside of Libby. Because vermiculite mined from Libby has been found to be contaminated with Libby amphibole asbestos (LA), a known human health risk, the U.S. Environmental Protection Agency (EPA) initiated an emergency response action in November 1999 to address questions and concerns raised by citizens of Libby regarding possible ongoing exposures to asbestos fibers as a result of historical mining, processing, and export of asbestos-containing vermiculite.

Based on current land use, the site on the west side of Highway 37 is divided into two distinct areas separated by City Service Road (also known as West Thomas Street): the area of the site to the south of City Service Road (approximately 12 acres) and a 4.7-acre recreational area known as Riverfront Park (formerly known as Riverside Park) to the north of City Service Road. For discussion purposes, these areas will be referred to throughout this report as Area 1 and Area 2, respectively. In addition, the embankments of Highway 37 on both sides of the highway on the south side of the Kootenai River, City Service Road, and Thomas Street are included as part of OU1 because of their immediate proximity to the site and the known presence of vermiculite. These areas will be referred to throughout this report as Area 3.

1.2 Key Features of the Libby Asbestos Superfund Site and OU1

1.2.1 Site OUs

To facilitate a multi-phase approach to remediation of the Site, eight separate OUs have been established. These OUs are shown in Figure 1-1 and include:

- **OU1.** OU1 is the subject of this remedial action (RA) report and includes the former Export Plant. OU1 is situated on the south side of the Kootenai River, just north of the downtown area of the City. OU1 includes the embankments of Highway 37, the former Export Plant, and Riverfront Park (formerly known as Riverside Park). The property is bounded by the Kootenai

River to the north, residential property to the east, the BNSF railroad thoroughfare to the south, and State of Montana property to the west.

- **OU2.** OU2 includes areas impacted by contamination released from the former Screening Plant. These areas include the former Screening Plant (Subarea 1), the Flyway property (Subarea 2), a privately-owned property (Subarea 3), and the Rainy Creek Road Frontages (Subarea 4). The Highway 37 right-of-way (ROW) adjacent to OU2 was included due to the proximity to OU2 and the known contamination in the ROW. For the purposes of this report, the contaminated portion of the Highway 37 ROW is considered part of Subareas 2 and 3 within OU2.

- **OU3.** The mine OU includes the former vermiculite mine and the geographic area (including ponds) surrounding the former vermiculite mine that has been impacted by releases from the mine, including Rainy Creek and the Kootenai River. Rainy Creek Road is also included in OU3. The geographic area of OU3 is based primarily upon the extent of contamination associated with releases from the former vermiculite mine.

- **OU4.** OU4 is defined as residential, commercial, industrial (not associated with former Grace operations), and public properties, including schools and parks, in and around the City, or those that have received material from the mine not associated with Grace operations. OU4 includes only those properties not included in other OUs.

- **OU5.** OU5 includes all properties that were part of the former Stimson Lumber Mill and are now owned and managed by the Kootenai Business Park Industrial Authority.

- **OU6.** The rail yard owned and operated by BNSF is defined geographically by the BNSF property boundaries and the extent of contamination associated with BNSF rail operations. Railroad ROW are also included in this OU and have not been geographically defined.

- **OU7.** The Troy OU includes all residential, commercial, and public properties in and around the Town of Troy, approximately 20 miles west of downtown Libby.

- **OU8.** OU8 is comprised of the US and Montana State Highways and secondary highways that lie within the boundaries of OU1, OU4, and OU7.

1.2.2 Site Contamination

This section provides information about the contamination in OU1 that existed at the time of the Record of Decision (ROD). All areas that were subject to previous investigation and removal actions but no longer pose a threat to human health and the environment will be monitored as part of the Selected Remedy. Previous investigations and removal actions are chronologically presented below.

OU1, from the early 1960s to approximately 1990, was used by Grace as the Export Plant for stockpiling, staging, and distributing vermiculite and vermiculite concentrate to vermiculite processing areas and insulation distributors outside of Libby. Ownership was transferred to the City in the mid-1990s.

The vermiculite deposit that was mined by Grace contains a distinct form of naturally-occurring amphibole asbestos that is comprised of a range of mineral types and morphologies. In various past reports, this form of amphibole asbestos has been termed interchangeably by the EPA as Libby Amphibole or more simply, LA. The term LA refers generally to amphibole materials that originated in the Libby vermiculite deposit, have the ability to form durable, long, and thin structures that are

generally respirable, can reasonably be expected to cause disease, and hence are considered the contaminant of concern at the site.

Because vermiculite mined from Libby has been found to be contaminated with LA and, known to cause human health effects, the EPA initiated an emergency response action in November 1999 to address questions and concerns raised by citizens of Libby regarding possible ongoing exposures to asbestos fibers as a result of historical mining, processing, and exportation of asbestos-containing vermiculite.

1.3 Site Background

Numerous hard rock mines have operated in the Libby area since the 1880s, but the dominant impact to human health and the environment in Libby has been from vermiculite mining and processing. Prospectors first located vermiculite deposits in the early 1900s on Rainy Creek northeast of Libby. Edward Alley, a local rancher, was also a prospector and explored the old gold mining tunnels and digs in the area. Reportedly, while exploring tunnels in the area, he stuck his miner's candle into the wall to chip away some ore samples. When he retrieved his candle, he noticed that the vermiculite around the candle had expanded, or "popped," and turned golden in color.

In 1919, Alley bought the Rainy Creek claims and started the vermiculite mining operation called the "Zonolite Company." While others thought the material was useless, he experimented with it and discovered it had good insulating qualities. Over time, vermiculite became a product used in insulation, feed additives, fertilizer/soil amendments, construction materials, absorbents, and packing materials. Many people used vermiculite products for insulation in their houses in and around the Site and soil additives in their gardens. In 1963, Grace bought the mine and associated processing facilities and operated them until 1990.

From the early 1960s to approximately 1990, the Export Plant was used by Grace for stockpiling and distributing vermiculite concentrate to Grace expansion plants, where vermiculite was heated and "popped" into its expanded form so that it could be used for insulation and other uses, and customers throughout the United States. Ownership was transferred to the City in the mid-1990s.

Throughout its history, portions of both OU1 Area 1 and 2 of the site have been leased to various parties for commercial and non-commercial enterprises. From approximately 1977 to 1997, organized youth baseball events (games and practices) were held at ball fields, which are centrally located in OU1 Area 1. Between approximately 1987 and 2000, the Millwork West Company, a retail lumberyard and building material supplier, leased the northwestern portion of Area 1. As described in Section 2 of this report, buildings and equipment used by Millwork West were removed and/or demolished as part of the removal activities conducted by Grace in 2001 and 2002.

Other commercial and industrial uses of the site also occurred in the past that utilized infrastructure at the site. These other commercial/industrial uses reportedly included a metal scrap dealer and a larch tree gum manufacturer. The infrastructure that supported these businesses included industrial power supply, a railroad spur, and truck scales. This infrastructure was removed during the removal activities conducted at the site.

1.3.1 Current Use

Area 1 is currently owned by the City and is undeveloped, with the exception of a small area of the site currently used by David Thompson Search and Rescue. In 2004, the search and rescue organization

constructed a building containing a main office and a five-bay garage on the northwest portion of the site on the south side of City Service Road. The garage is used for storing search and rescue equipment and vehicles. Several other agencies, including local and state law enforcement, also hold meetings in the main office. EPA has provided guidance to the City when conducting activities at the site that disturb soil.

Area 2, Riverfront Park, is also currently owned by the City and serves a variety of recreational visitors. The main features of Area 2 include two boat ramps, a pavilion, picnic tables, and a pumphouse. The newer of the two boat ramps is used by recreational boaters and commercial fishing outfitters; the older ramp is not commonly used due to swift current at its approach. The pumphouse houses a pump that draws non-potable water from the Kootenai River. The pump was installed jointly by the City and Lincoln County in 1999 to provide a backup water source to local fire departments. The pumphouse is accessed by City personnel in order to perform maintenance on the pump. The pump is connected to an external water spigot, which is used by the City to draw water for street sweeping and other maintenance operations, and for other workers (such as employees of local fill pits and contractors working on EPA's removal program) to draw water primarily for use in dust suppression equipment. Access to Area 2 is unrestricted.

Area 3 is owned and maintained by the Montana Department of Transportation (MDT). MDT currently performs only periodic maintenance of these embankments as needed. The types of maintenance activities conducted by MDT include application of herbicides, replacement of guardrails and guardrail posts, and replacement and maintenance of roadside light posts. Access to this area is unrestricted.

1.3.2 Future Use

Future use of Area 1 is a proposed City park. This RA report addresses the remedial activities that precede the park features development. The City expects that David Thompson Search and Rescue will continue to utilize the northwest portion of the site. A change in land use is not currently anticipated for Area 2 (Riverfront Park), though the river revetment to the east was refortified and is included in this RA report. It is also anticipated that Area 3 will not change use and will remain undeveloped and owned and maintained by MDT.

1.4 Report Organization

In accordance with the EPA guidance for National Priorities List site close-out procedures (EPA 2011a), this report is organized into the following ten sections and three appendices. Minor rearrangement of the section contents recommended by the guidance was made to the report for clarity.

- **Section 1 - Introduction**: provides a description and history of the site.
- **Section 2 - Operable Unit 1 Background**: provides a summary of the pre-ROD investigation and removal actions, the ROD requirements and remedial action objectives (RAOs) for OU1, and a summary of the remedial design.
- **Section 3 - Construction Activities**: provides a summary of the RA construction activities conducted and a summary of soil sample results.
- **Section 4 - Chronology of Events**: provides a chronology of major events for OU1, starting with the signing of the ROD.

- **Section 5 - Performance Standards and Construction Quality Control**: provides a comparison of current site conditions to the RAOs, a description of construction quality assurance and control, and brief overview of quality assurance/quality control (QA/QC) procedures employed.
- **Section 6 - Final Inspections and Certifications**: provides a summary of site inspections, adherence to health and safety requirements during the RA, and the approach for institutional controls (ICs).
- **Section 7 - Operation and Maintenance Activities**: provides a description of the monitoring and maintenance programs that will be in place to ensure that the selected remedy continues to provide protection of human health and the environment.
- **Section 8 - Summary of Project Costs**: provides a summary of project costs associated with the RA to present, including projected operations and maintenance (O&M) costs, and a comparison of actual costs to the cost estimates in the ROD.
- **Section 9 - Observations and Lessons Learned**: provides a description of successes, problems encountered, and solutions related to the RA implementation.
- **Section 10 - Operable Unit 1 Contact Information**: provides a list of contact information for personnel involved in the OU1 RA and O&M, including EPA personnel, Montana Department of Environmental Quality (DEQ) personnel, and RA contractor personnel.
- **Appendix A - Cost Summary**: provides a more detailed breakout of incurred costs reported in Section 8.
- **Appendix B - RA Construction As-Builts**: provides RA as-built drawings.
- **Appendix C - Analytical Results**: provides summary tables for confirmation soil results and personal and perimeter air sample results.
- **Appendix D - RA Construction Documents**: provides documentation of RA construction including Quality Assurance Reports (QARs), and soil compaction results
- **Appendix E - Change / Modification Logs**: provides documentation of design modifications made during the removal and restoration activities due to unforeseen conditions.
- **Appendix F - Joint Site Inspection Memorandum**: provides documentation of the joint site inspection findings conducted on August 8, 2012.

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Section 2

Operable Unit 1 Background

Investigation and removal activities have been ongoing at the Site in general, and OU1 in specific, since the EPA began its emergency response in 1999. As a result, much of OU1 had already undergone significant remediation by the time the RI/FS was completed. It was determined that the actions consisting of excavation, offsite disposal and engineered cover were adequate to protect human health and the environment. The following sections summarize pre-ROD investigation and removal activities and outline the ROD requirements. For more details on pre-ROD events, refer to the OU1 Final RI Report (EPA 2009a).

2.1 OU1 Historical Investigations and Response Activities

Multiple investigation, pre-removal, and removal events occurred from 1999 until the signing of the OU1 ROD in 2010. The following is a summary of those events by area. For detailed accounts of these events, including sample information and analytical results, refer to the OU1 Final RI Report (EPA 2009a). Confirmation soil sample depths were measured from the bottom of the excavation (i.e., excavation floor is 0 inches below ground surface [bgs]). All other soil sample depths were measured from existing ground surface at the time of sampling.

In general, investigatory soil samples were analyzed using two Libby Site-specific polarized light microscopy (PLM) methods: a visual estimation method (PLM-VE) (Syracuse Research Corporation [SRC] 2003) and a gravimetric method (PLM-Grav) (SRC 2002). Confirmation soil and investigatory bulk material samples were analyzed using the National Institute of Occupational Safety and Health (NIOSH) polarized light microscopy (PLM) method 9002 (NIOSH 1994a). Air samples were analyzed using one or more of the following methods: the NIOSH phase contrast microscopy (PCM) method 7400 (NIOSH 1994b); the transmission electron microscopy (TEM) Asbestos Hazard Emergency Response Act (AHERA) requirements provided in Appendix A to Subpart E of 40 Code of Federal Regulations 763.86. (EPA 1987); and the TEM method International Organization for Standardization (ISO) 10312 (ISO 1995). Dust samples were analyzed using the TEM AHERA method (EPA 1987). In addition, all of these analytical methods employed Libby Site-specific modifications, as were current and approved by the EPA at the time of analysis.

2.1.1 Area 1

- **Investigation Soil Sampling – December 1999.** In December 1999, a total of 80 soil samples (72 samples and 8 field duplicates) were collected from Area 1. Samples were collected as grab samples from the 0- to 2-inch, 0- to 24-inch, or 2- to 12- inch depth interval and analyzed by PLM. Analytical results ranged from non-detect (ND) to 5 percent (%) LA.

- **Investigation Soil and Air Sampling – March/April 2000.** Between March 10 and 11, 2000, 17 grab soil samples and one duplicate were collected from the 0- to 2-inch depth interval, and 16 grab soil samples and five field duplicates from the 2- to 12-inch depth interval. One grab sample was also collected from bags of vermiculite stored outside the warehouse. PLM analytical results ranged from ND to 10% LA.

- In addition to soil sampling, ambient air samples were collected from various locations within the Area 1 boundary on separate days in April 2000 from high-volume stationary air samplers. TEM analytical results indicated LA in ambient air at all three sample locations at concentrations ranging from 0.0001 to 0.0023 structures per cubic centimeter (s/cc).

- **Activity-Based Sampling (ABS) – June 2000.** Two samplers were monitored during the event: one while sweeping the floor of the planar shop's break room; the other while sweeping and moving bags of vermiculite insulation inside the bag house portion of the planar shop. TEM analytical results for the two personal air samples indicated LA in concentrations of 0.6470 s/cc and 2.3666 s/cc for the sweeper and the bag mover, respectively.

- **Area 1 Removal Event – July 2000 through January 2001.** Grace temporarily relocated the onsite business (Millwork West), cleaned five onsite historic buildings and the building's contents, excavated and disposed of vermiculite and LA-contaminated soil and debris, and restored the property. Contaminated materials were disposed of at the former Libby vermiculite mine.

- During soil excavation, 63 confirmation soil samples were collected from the floor of the excavation of which a total of 18 split samples and one duplicate split sample were analyzed. PLM results ranged from ND to 2% LA. Grace, however, was directed to remove additional soil in 4- to 6-inch increments until EPA removal clearance criterion of less than (<) 1% LA was met in each section of the excavation.

- The backfill materials used at Area 1 were obtained from the EPA-approved source Plum Creek pit located in Libby. Restoration at Area 1 consisted of backfilling the entire excavated area with a sufficient layer of common fill to bring the grade to within 6 inches of the original surveyed grade. The final 6 inches were filled with either gravel or topsoil, as appropriate, depending upon the original surface conditions.

- **Area 1 Investigation Sampling – March/April/August 2001.** A total of 15 soil samples were collected at Area 1, as follows:

  - three grab samples were collected from the 0- to 1-inch depth interval near site buildings;

  - five grab samples and one duplicate were collected from the 0- to 6-inch depth interval near site buildings;

  - one grab sample of in-place 1 ½ -inch minus grade fill material (from the Granite pit) from the 0- to 6-inch depth interval;

  - one 3-point composite sample was collected from the 0- to 4-inch depth interval at the site on/off ramp; and

  - one 3-point composite sample was collected from 0- to 4-inch depth interval near the BNSF railroad tracks.

  Four grab samples were collected from the 0- to 4-inch depth interval. Analytical results for LA by PLM ranged from ND to 35% in the soil samples, and ND for LA for the in-place fill material sample.

Thirty-nine bulk material samples (e.g., wood shavings, insulation, debris, etc.) were collected from within the five buildings. Seven samples were collected within the pole barn; seven within the planar shop; six within the scale house/lumber storage building; 13 within the warehouse; and six within the shed. Analytical results by PLM of the bulk material samples ranged from ND to 5% LA.

Two, single-point dust samples were collected; one from a horizontal surface inside the warehouse and the other from the exterior surface of the warehouse foundation. TEM analytical results indicated 169,836 structures per square centimeter (s/cm^2) for LA in dust on the building's foundation, while the indoor sample was ND for LA. Four separate 3-point composite dust samples were collected from horizontal surfaces inside the pole barn, the surface of equipment stored inside the shed, and from the surface of equipment and supplies stored inside each of two site storage containers. Analytical results indicated 129,127 s/cm^2; 97,455 s/cm^2; 19,491 s/cm^2; and 40,200 s/cm^2 for LA, respectively.

- **Area 1 Removal Event – September/October 2001.** Grace conducted a cleanup action to address residual LA contamination in site buildings and soil. Ultimately, four of the five buildings (all but the planar shop) were demolished and additional soil was excavated from the site. The contaminated soil and debris was disposed of at the former Libby vermiculite mine. Confirmation soil samples and dust, for ambient air and personal air, were collected during the removal activities.

  Twenty-three subsurface confirmation soil samples were collected from depths varying between 16 and 50 inches bgs in the former pole barn, former warehouse, former scale house/lumber storage building, former shed, east ball fields, and BNSF spur extending just south of the planar shop. Composite samples of between two and five points were collected. Analytical results were <1% LA by PLM. Thirty-nine additional surface soil samples were collected from suspected of cross-contaminated areas that were previously remediated. These surface samples were 5-point composites from the 0- to 2-inch depth interval. Analytical results were either ND or <1% LA by PLM. In order to evaluate cleanup needs, eight additional soil samples were collected from areas that were not anticipated to have been impacted by removal activities; six were surface samples from 0 to 2 inches bgs, and two were subsurface samples from 8 to 10 inches bgs. PLM results of the surface samples were ND for LA, while the subsurface samples were <1% LA. Consequently, Grace covered impacted areas with a 4-inch layer of crushed gravel. Restoration was conducted with backfill materials obtained from the Plum Creek gravel pit located in Libby.

  One 3-point composite dust sample was collected from the surface of decontaminated lumber moved outside of the exclusion zone. Analytical results were ND for LA. One 3-point composite dust sample was collected from the surface of a lumber pile located inside the exclusion zone. Analytical results indicated LA loading at 365 s/cm^2. Additionally, six 3-point composite dust samples were collected in and around the planar shop. Analytic results for the six samples indicated LA loading of between 609 s/cm^2 and 444,636 s/cm^2. All dust samples were analyzed by TEM.

  Thirty-six personal air monitoring samples were collected during this removal effort. Analytical results for thirty samples, analyzed via TEM ISO 10312, indicated total LA concentrations ranging from ND to 0.0919 s/cc. Thirty-three samples were analyzed via TEM AHERA, indicating total LA concentrations ranging from ND to 0.09290 s/cc. Thirty-two samples were

analyzed via PCM, indicating concentrations ranging from ND to 0.231 fibers per cubic centimeter (f/cc).

- **Area 1 Investigation Sampling – April/May 2002.** Two, 3-point composite soil samples were collected from areas at the site where suspect mine-related material had been identified. Visible vermiculite was observed and believed to be cross-contaminated from BNSF railroad excavation activities. Analytical results indicated both samples contained <1% LA by PLM.

  Two bulk materials samples were collected from the interior of equipment owned and operated by Millwork West. Analytical results from both samples were ND for LA by PLM.

- **Area 1 Removal Event – October through December 2002.** Grace began removing the remaining building material and debris from Area 1. Contaminated soil from the footprint of the demolished planar shop and from an area near the BNSF railroad tracks was also removed. Contaminated soil and building materials were disposed of at the former Libby vermiculite mine. Forty-four, 5- point composite subsurface confirmation soil samples were collected from the floor of the excavations. A total of 36 soil samples were analyzed by PLM, while 8 samples were archived at a project-contracted laboratory. Analytical results were either ND or <1% LA. Restoration was conducted using backfill materials from the Plum Creek pit.

  Ten personal air samples were also collected and analyzed via PCM and analytical results ranged from ND to 0.492 f/cc.

- **Area 1 City Water Line Installation – June through September 2006.** The City began excavating a trench through the field portion of Area 1 in preparation for installing a new drinking water supply pipeline. A total of eight, 5-point composite soil samples were collected from the excavation spoils: four from the stockpiled material in the 0- to 2-inch depth interval and four from the 0- to 2-inch depth interval in the area adjacent to and surrounding the stockpile. Analytical results ranged from ND to 3% LA by PLM. Spoils were removed and transported to the former Libby vermiculite mine for disposal.

- **Other Area 1 Activity.** The City obtained approximately 50 cubic yards of angular riprap rock from the United States Army Corps of Engineers' (USACE's) Fisher River Road pit to cover two areas of exposed orange fencing: one revetment along the Kootenai River bank in between the new and old boat ramps and the other on the surface of the old boat ramp.

- **Area 1 Investigation Sampling – September to November 2007.** Forty-two surface (0 to 6 inches bgs) soil samples (including 3 field duplicates) were collected from Area 1. Samples were collected as 30-point composite samples. Analytical results indicated 29 samples as non-detect and 13 samples with trace amounts of LA by PLM.

  Visible vermiculite observations were made at a total of 1,170 point inspections. Vermiculite was not observed in 1,032 (88.2%) of the point inspections in Area 1. Low levels of vermiculite were observed at 118 (10.1%) of the point inspections; medium levels were observed at 16 (1.4%), of the point inspections; and high levels were observed at 4 (0.3%), of point inspections.

  ABS was conducted in the David Thompson Search and Rescue building. A total of 22 air samples were collected during the indoor ABS activities. TEM analytical results of the active-garage scenario ranged from ND to 0.0699 s/cc; active- meeting room results ranged from 0.0011 s/cc to 0.0088 s/cc; and passive-meeting room results ranged from 0.0003 s/cc to

0.0079 s/cc. Additionally, a total of nine microvacuum dust samples were collected from the building, three each from the meeting room, garage, and rescue vehicles. LA was detected in one sample collected from the meeting room and one sample collected from the garage. The total LA loading for the meeting room and garage dust samples were reported at 75 and 20 s/cm^2, respectively. Samples were analyzed by TEM.

Personal air samples were collected from the workers operating a bush hog. A total of eight personal air samples were collected during this activity. Of the eight samples collected, LA was detected in six samples and concentrations ranged from 0.0038 s/cc to 0.0715 s/cc by TEM.

2.1.2 Area 2

- **Area 2 Investigation Sampling – May/July 2003**. A 2-inch thick layer of vermiculite along the west side of the boat ramp was discovered during construction of a new boat ramp. The layer was approximately 8 to 10 inches below the ground surface. Additional vermiculite containing soil was exposed during renovation of the picnic area. A visual inspection and soil sampling was conducted. Three, 5-point composite soil samples from the 0- to 1-inch depth interval were collected. Analytical results were ND by PLM.

  Two 5-point composites soil samples from the 0- to 6-inch depth interval were subsequently collected. Results for the two samples, which were analyzed by all three PLM methods, ranged from ND to <1% LA.

- **Area 2 Pre-Removal Event – September/October 2003**. Pre-Removal characterization was conducted, which included a verbal interview, site visual inspection, and surface and subsurface soil sample collection. The verbal interview confirmed historical on-site vermiculite storage.

  Vermiculite was observed at several locations within the park: notable amounts were observed on the southwest side embankment and at the bottom of the embankment on the east side of Highway 37.

  Soil sampling activities included both surface and subsurface test pit samples. A total of 19 surface soil samples were collected. All surface samples were either 4- or 5-point composites from the 0- to 6-inch depth interval.

  Twelve test pits were excavated and subsurface sampled. Grab samples were collected at depths ranging from 12 to 39 inches bgs. PLM analytical results indicated that LA was present in nine of the 26 surface soil samples at levels ranging from trace to <1%, and in three of the 18 subsurface soil samples at trace levels.

- **Area 2 Removal Event – October/November 2003.** Within Riverfront Park, soil was excavated to a depth of 12 inches bgs throughout the park area, with the exception of the Kootenai riverbank and the northeast side of City Service Road where soils were excavated to a depth of 6 inches bgs. Excavation of the embankment on the southeast side of City Service Road was not conducted. Additionally, where visible vermiculite was observed or where elevated LA analytical results were detected above EPA's removal clearance criteria, additional 6-inch lifts were removed, iteratively, to a maximum depth of 3 feet bgs. However, along the riverbank and City Service Road embankment, maximum excavation depths were 12 inches bgs.

Fifty-nine, 5-point composite confirmation soil samples were collected at depths ranging from 6 to 36 inches bgs. Analytical results for the samples were either ND or <1% LA by PLM, with the exception of one sample, which was 2% LA, prompting removal of an additional 6-inch layer of soil. Analytical results for the subsequent excavation were <1% LA.

As a visual barrier, orange snow fencing was placed at the excavation floor. The area was restored to original grade using materials from the Boothman Pit and hydroseeded.

A new boat ramp was installed downstream of the existing boat ramp. The removal contractor (RC), Environmental Restoration, obtained riprap from the USACE Fisher River Road pit, which was placed along the toe of the bank.

- **Other Area 2 Activity - July 2007.** Subsurface vermiculite was brought to the surface during the installation of cable by a phone company from a depth of approximately two feet bgs. The excavated soils were disposed of at the former Libby vermiculite mine. The area was covered with four to six inches of rock.

- **Area 2 Investigation Sampling - September 2007.** Nine, 30-point composite surface samples were collected. All analytical results were ND for LA.

  A total of 270 point inspections for visible vermiculite were made. Vermiculite was not observed at 242 (89.6%) of the point inspections. Low levels of vermiculite were observed at 28 (10.4%) of the point inspections.

- **Area 2 Quick Response Removal Event - May 2008.** Soils were excavated to place foundation footings and a full concrete slab in the construction of a new City pavilion. The footings area was excavated to an approximate depth of 57 inches bgs. The excavated soils were disposed of at the former Libby vermiculite mine. The second area was excavated to provide a construction access ramp to the bottom of the City pavilion excavation. Restoration activities were performed by the City using 3 inches of common fill.

- **Area 2 Quick Response Removal Event - July 2008.** Several small areas containing medium to high amounts of vermiculite as well as what appeared to be raw LA were found. The type of vermiculite observed was apparently not from a local source, but was suspected as an import. No vermiculite was observed in these areas after the removal was completed.

2.1.3 Embankments Area 3

- **Area 3 Embankment Investigation Activities - September 2007.** Twenty-two, 30-point composite surface samples from 0-6 inches bgs were collected. Analytical results by PLM indicated 19 samples as ND, two as trace, and l as <1% of LA.

  Fifteen grab soil samples were collected from 0 to 24 inches bgs. PLM LA analytical results ranged from ND to trace and vermiculite was not observed in any of the samples.

  A total of 660 point inspections for visible vermiculite were made. Vermiculite was not observed at 584 (88.5%) of the point inspections. Low levels of vermiculite were observed at 58 (8.8%) of the point inspections; medium levels were observed at 14 (2.1%); and high levels of vermiculite were observed at 4 (0.6%) of the embankment point inspections.

2.1.4 Other OU1 Investigation Activities

- **OU1 Ambient Air Sampling– October 2006-2007 and November/December 2007.** A total of 143 outdoor ambient air samples were collected from four property address locations: 1915 Kootenai River Road, 247 Indian Head Road, Mineral Avenue, and 1427 Highway 37 (J. Neils Park). Analytical results by TEM for LA ranged from ND to 0.00016 s/cc, with an average concentration of 0.00001 s/cc. Thirty-two results were above the average and the remaining 111 results were below the average.

2.2 ROD Requirements

This section describes the RAOs and Selected Remedy for the OU1 site.

2.2.1 Remedial Action Objectives

RAOs are media- and source-specific goals to be achieved through completion of a remedy that is protective of human health and the environment. These objectives are typically expressed in terms of the contaminant, the concentration of the contaminant, and the exposure route and receptor. They provide the basis for determining whether protection of human health and the environment is achieved for the selected remedy. RAOs for OU1 were developed by evaluating several sources of information, including results of the risk assessments conducted as part of the OU1 RI Report (EPA 2009a) and current and future land use of the site.

Based on determinations of human health risks (EPA 2009b), LA in vermiculite and/or soil was likely to pose a current exposure risk to human receptors through inhalation of fibers released during active soil disturbance activities and inhalation of fibers in outdoor (ambient) air. It was expected that any risk from potential future disturbances that would expose subsurface, LA-containing soil might be substantially higher than under the current conditions prior to the RA. Site conditions are such that surface soils have either been capped or else removed and backfilled with clean soil as per the established removal clearance criteria for the RA.

The current and anticipated future land uses for the site were an important consideration for the development of RAOs to ensure remedial alternatives are protective of human health and the environment. Area 1 is owned by the City and a City park development is proposed for the majority of this area. Area 2 (Riverfront Park) is also owned by the City and used by the public. Area 3 consists of Highway 37 and City Service Road eastbound embankments, maintained by the MDT and the City, respectively, with no known current plans to disturb the in-place soils. The northwest corner of the site is currently occupied by the David Thompson Search and Rescue building.

The RAOs for the site presented below were based on anticipated future recreational, commercial, and/or light industrial use of the site:

1. Break the exposure pathways for inhalation of LA fibers that would result in unacceptable cancer risk or non-cancer hazard.

2. Control erosion of contaminated soil by wind and water from source locations to prevent exposures and the spread of contamination to unimpacted locations.

3. Implement controls to prevent uses of the site that could pose unacceptable risks to human health or the environment or compromise the remedy.

At a typical site, RA is required when contamination poses cancer risks that exceed 1 in 10,000 (or 1E-04) (EPA 2010). The RAOs for OU1 addressed LA contamination that poses cancer risks in the ranges between 1 in 10,000 and 1 in 1,000,000 (1E-06). Remedial goals (RGs) are typically used to guide such RA. RGs are defined as the average concentration of a chemical or a contaminant in an exposure unit associated with a target risk level such that concentrations at or below the RG do not pose an unacceptable risk. However, RGs were not developed for OU1, or the remainder of the Site (EPA 2010).

RGs are typically developed by computing the concentration of a contaminant in soil that corresponds to an excess cancer risk of 1E-04. However, such a computation is not possible at present because of the high variability in the relationship between asbestos in soil and asbestos in air. Even if the computations were possible, the ability to measure asbestos in surface and subsurface soil is presently limited by the available technologies and methods (EPA 2010). Additionally, noncancer risks from inhalation of asbestos fibers have also been recognized, but there is no current methodology to quantify noncancer risks for asbestos (EPA 2009b).

For these reasons, RGs for asbestos were not established for site soils. If the RAOs for asbestos contamination are achieved through implementation of the Selected Remedy, then risks to humans from inhalation exposures to asbestos are expected to be acceptable (EPA 2010).

2.2.2 Selected Remedy

As presented in the ROD for OU1 (EPA 2010), the Selected Remedy for remediation of asbestos-contaminated soil is a combination of Alternative 3b (In-Place Containment of Contaminated Soil, Removal of Contaminated Soil for Utility Corridors, Offsite Disposal, and ICs with Monitoring) and Alternative 4a (Partial Removal of Contaminated Soil, Offsite Disposal, and ICs with Monitoring). These removal and containment remedies will achieve all RAOs by eliminating current exposure pathways and monitoring to ensure that the remedy continues to protect human health and the environment. A summary of the Selected Remedies, as detailed in the ROD, is as follows:

- The majority of the remediation work will consist of containment via construction of soil covers to encapsulate areas of surface contamination. The FS anticipated that approximately nine acres of the site would be covered.
- Removal and offsite disposal of contaminated materials will be used in the proposed utility corridor areas. Flexibility to remove other areas of contamination is included to preemptively remove contaminated materials as land use issues develop.
- A visible marker layer will be placed at the bottom of the cover to denote the extent of the cleanup.
- Clean fill for excavations and construction of covers will be obtained from offsite subsoil and topsoil sources outside of the Libby valley. Final quantities will be evaluated in the design process.
- Removal and offsite disposal of contaminated materials will be used in the proposed utility corridor areas which are expected to encompass approximately 10 percent of Areas 1 and 2. Additionally, by adding Alternative 4a to the selected remedy, EPA obtains the flexibility to remove other areas of contamination that may need to be removed preemptively due to land use issues.

- Employ ICs to minimize risks posed to human receptors from remaining LA in subsurface soil by limiting uses that might create an exposure pathway or damage the remedy. EPA anticipates that ICs for OU1 will include governmental and/or proprietary land use restrictions, and informational devices. Governmental ICs, for example, may impose land or resource restrictions using government authority, such as building codes, permits, or zoning regulations that are administered by local agencies. Proprietary controls, either private, governmental, or a combination of the two, typically involve landowner agreements or easements that restrict certain activities on the property. ICs are considered an integral part of the remedy, so development and implementation of the ICs will be conducted as part of the remedial action.
- If needed, install engineered controls to warn the public and limit access to the site.
- Maintain the integrity of the selected remedy and monitor the remedy to ensure that the controls are effective.

Points of clarification presented in Section 14, Documentation of Significant Changes of the ROD are regarded as subcriteria for determining whether the remedy put in-place at OU1 meets the criteria for determination of operational and functional (O&F). The following is a summary of the points of clarification and the manner in which the EPA will address them:

- **Risk Assessment.** The EPA will conduct a quantitative, OU1 post-construction risk assessment, to include ABS, at OU1 following the completion of construction to confirm effectiveness of the remedy (EPA 2010). It is anticipated that risk assessment sampling activities will be conducted in summer 2013.
- **New Information.** When the site-wide risk assessment is complete, the agencies will re-evaluate the remedy in accordance with the review requirements at CERCLA Section 121(c). New information concerning toxicity factors will also be evaluated in five-year reviews. If unacceptable exposures are identified, the EPA will take action as necessary to ensure that the soil-to-air pathway is broken. Actions may include additional excavation, improving covers, and/or strengthening ICs. In addition, the EPA will conduct five-year reviews as part of the ongoing O&M of the remedy.
- **Planned Future Uses.** The EPA will work closely with the City during design so that design can complement any planned future uses.
- **Removal of Contamination at Depth in Excavations.** Encountered LA source materials during excavation activities will be removed to a maximum of 3 feet below finished grade. A visible barrier marking the extent of excavation will be placed at the bottom of the excavation before backfilling.

The implementation of the Selected Remedies is detailed in Sections 3 and 6.3 of this report. An evaluation of the performance of the Selected Remedies in terms of satisfying the RAOs is presented in Section 5.1.

2.3 Remedial Design

Subsequent to the ROD completion and preceding construction, the City retained a designer to develop the proposed park. RA design drawings (EPA 2011b) were prepared in response to the City's proposed design for this RA. Construction activities at the site were conducted in accordance with the Libby Site Response Action Work Plan (RAWP) (USACE 2010a), and the design drawings. OU1 remediation plans were prepared to supplement the RAWP and address OU1 site-specific remediation. During construction, modifications were made to these site-specific RAWP, as documented in Section 3 and the as-built drawings provided in Appendix B.

Section 3
Construction Activities

RA construction activities were conducted in accordance with the RAWP (USACE 2010) and design drawings (EPA 2011b). Construction activities included:

- Mobilization and Site Preparation;
- Excavation and Disposal of Contaminated Soil;
- Riverbank revetment;
- Boat ramp restoration;
- Backfill; and
- Erosion and stormwater control.

The following is a brief description of RA construction activities from mobilization through demobilization. RA construction as-builts and construction-related documents are provided in Appendices B and C.

3.1 Mobilization and Site Preparation

The mobilization and site preparation for this RA commenced on August 9, 2011 and followed the same progression as previous removal activities at the site. The necessary equipment including, but not limited to, a decontamination trailer, excavator, and potable and non-potable water tanks were mobilized to the site. The RC, PRI-ER, delineated the removal areas by removing the existing safety fence and replacing it with new orange fencing and yellow caution tape. The site was cleared of ground-cover vegetation to facilitate the surveying crew. U-Dig, the utility locate service, was contacted and utilities were marked within the work zone prior to excavation. Any hazards existing within the work zone were isolated or removed. RC and third-party quality assurance (TQA) personnel, CDM Smith, walked through the site during this set-up to ensure that each contractor had current copies of remediation designs (Appendix B) and concurred on project design objectives. Following this inspection, asbestos tape was added to the orange construction fencing to establish the removal areas as an exclusion zone. The RC collected pre-excavation photos to document current site conditions when the RC took control of the site.

3.2 Removal Activities

One of the main construction components of the RA was the excavation and offsite disposal of contaminated soil. OU1 is unique compared to the other Libby OUs in that finish grade was not pre-existing. The City proposed City park development for OU1. The City contracted with a designer, WGM Group, who provided site finish grades. These grades were used to determine depth of excavation across the site, based on a minimum 18 inch cover of import soil over native soils containing <1% LA. An additional 18 inches of soil was excavated for those areas with analytical results greater than or equal to (≥) 1% LA. The excavation area would be resampled and analyzed for informational purposes, i.e. soils with elevated concentrations ≥1% LA would have a minimum 36 inches cover of import soil.

Furthermore, an orange construction barrier was placed on the subgrade surface prior to import soil placement. The marker barrier was installed as a visual means of identifying the interface between native and import soils.

A comprehensive excavation plan was created and represented in the field using a 25 feet on-center alpha-numeric grid system. Each grid intersecting point had a construction stake with elevation information that the excavation operators and soil sample technician could spatially reference on the plans.

A total of 25,656 cubic yards (cy) of contaminated soil was removed from OU1 and disposed of at the former vermiculite mine. Volume of soil removed was not tracked separately by area because areas were excavated concurrently. Specific removal activities by area are described in the following subsections.

3.2.1 Excavation of Contaminated Soil

3.2.1.1 Area 1

Site preparation activities began August 17, 2011 with removal of existing railroad structures, a loading ramp and railroading siding, which were contained within the exclusion zone. Prior to intrusive excavation, these structures were removed, decontaminated, and staged for the City's off-haul by the RC.

Site removal activities began on September 30, 2011. Excavation began east of and at the northeast corner of the David Thompson Search and Rescue parking area and adjacent to the south edge of pavement of City Service Road and proceeded east. Two additional excavation crews began south of and adjacent to the first excavation crew, working in an easterly direction. When each excavation crew completed excavation to final depth and to the easterly limits of construction, the crews would relocate to the westerly limits of excavation south of the just completed section and begin excavating anew in the same manner. This facilitated disposal trucks access to the site and to the excavation crews traveling on imported laydown soil, mitigating cross-contamination.

Area 1 excavation activities were completed for the 2011 construction season on October 24, 2011 at the southeast corner of the site. On October 29, 2011, excavation activities were completed at the proposed detention basin for future stormwater control. No further intrusive work was conducted for the remainder of 2011.

A cooperative agreement was reached between the City and the EPA for a new City sanitary sewer line where City employees would construct the entire system and the RC would only be responsible for transportation related activities, disposal of excavation spoils at the mine, and the final 12-inch trench backfill section. Sanitary sewer trench construction began May 10, 2012 at the existing sanitary sewer manhole north of and adjacent to the northwest corner of the David Thompson Search and Rescue building and progressed 356 feet to the southeast and 338 feet to the southwest. The new sanitary sewer system was completed May 30, 2012.

On June 8, 2012, removal activities reconvened with the final excavation of Area 1 at City Service Road. In accordance with the design drawings; City Service Road asphaltic concrete (AC) removal was staged where the westbound lane was first removed in order to maintain one-way traffic on the eastbound lane. AC removal began adjacent to the David Thompson Search and Rescue building and progressed east. When the westbound AC was removed, the same process was employed for the eastbound lane. AC removal was completed on June 12, 2012 and the roadway base section excavation

began at the easterly limits on June 13, 2012. The roadway base section excavation was completed on June 15, 2012. The roadway was realigned and replaced with crushed rock as discussed in Section 3.3.

3.2.1.2 Area 2

On February 28, 2012 the RC mobilized to the site to begin work in Area 2 to reinforce the existing deteriorated revetment along the south river bank of the Kootenai River, beginning just east of the gravel boat ramp and extending just west of the concrete boat ramp. Clearing and grubbing preceded rip rap placement. Rip rap placement followed the proposed design with D85-D100 sized rock submerged to establish the toe of slope within the river bottom, where D85 and D100 are the rock sizes that correspond to 85% and 100% of the sample passing by weight. Following the toe of slope establishment, USACE Class V rock was placed on the embankment toe and continued upslope to the top of the embankment. A total of 3,850 tons of rock were placed as part of the revetment. Revetment placement was completed March 13, 2012, though some minor hand work continued the following day to chink voids and ensure three-point contact on unstable rocks.

Subsequent to the revetment construction, the new Armorflex™ mat boat ramp construction began May 30, 2012 with the excavation at the existing concrete ramp's toe of slope. A Portland cement concrete pad was placed in advance of the proposed boat ramp surface which was completed June 12, 2012. Work resumed at the boat ramp on June 18, 2012 to install the Armorflex™ mat. The Portland cement concrete anchors for the boat ramp were poured on June 19, 2012 and surrounding area along the embankment was dressed with rip rap which was completed August 10, 2012.

3.2.1.3 Area 3

The RC began excavation at Area 3 concurrent with the Search and Rescue parking area excavation, at Highway 37 west embankment on August 18 and completed August 25, 2011. The embankment soil was excavated to a depth of approximately 6 inches bgs. On August 19, 2011 the RC began the 6-inch excavation of the City Service Road south embankment in Area 3. Uniform removal of contaminated soil to approximately 6 inches bgs was excavated in the two discrete locations of Area 3 on both east and west embankments of Highway 37, north of City Service Road. Excavation began on April 19, 2012 at the east embankment followed by the west embankment which was completed on April 26, 2012.

3.2.2 Offsite Disposal of Contaminated Soil

As specified in the Selected Remedy, the contaminated soils were excavated and hauled to the former vermiculite mine for offsite disposal. All haul trucks and trailers working on the Libby project were required to have water-tight beds. These sealed beds allowed water conditioned soil, for the purpose of fugitive dust mitigation, to be placed in the bed of the dump truck without leaking contamination. In addition, all trucks and trailers used tarps secured over the top of the bed to mitigate fugitive dust during transport. To prevent contamination of the interior of the truck, a negative air system maintained positive pressure in the cab of the truck while in excavation areas and traveling on the mine road. These trucks and trailers delivered material to an area along the mine road called the amphitheater and then underwent a thorough decontamination before leaving the mine. Soil was taken from the amphitheater by mine-designated vehicles to areas farther up the mine road for disposal.

3.2.3 Confirmation Soil Sampling

Confirmation composite soil samples were collected from the bottom of discrete excavated areas, in sizes no larger than 2,500 square feet by combining the 25-foot excavation grid system into 50-foot cells. These samples were collected, handled, and analyzed in accordance with the Response Action Sampling and Analysis Plan (EPA 2011c). The sample depths for confirmation soil samples were measured from original ground surface to the excavation floor. Sample depths typically ranged from 18 to 36 inches bgs across the site.

A total of 241 confirmation soil samples were collected and analyzed throughout the duration of the RA. Samples were 30-point composites and were generally collected from the 18 to 20-inch depth interval. A 30-point inspection for visible vermiculite was also performed in each sampled area to ensure clearance removal protocols were achieved. The analytical results for these samples ranged from ND to 5% LA by the NIOSH PLM 9002 method (NIOSH 1994a). A total of eight out of the 241 samples had results ≥1% LA. Figures 3-1 through 3-4 show the confirmation sample areas beneath the engineered cover at which residual contamination may be encountered across OU1. Sample results are provided in Appendix C.

3.3 Backfill, Compaction and Placement of Cover

All backfill materials were sourced from borrow areas at Ward Pit, Noble Pit, Nickelback Pit, USACE Fisher River Rip Rap Pit, Wolf Creek Rip Rap Pit, Libby City/County Pit, Granite Pit and Chapman Pit outside of the Libby valley and were tested prior to placement. As detailed in the RAWP (USACE 2010a), backfill materials were tested to ensure that they are both within specifications for the respective fill type and that they were not contaminated with LA.

Per the RAWP and design drawings, a visible marker layer was placed at the bottom of the excavation prior to backfill. Orange construction fence was placed directly upon the finished subgrade prior to placing import soils.

The project comprised of six typical cross sections with varied soil types and thicknesses depending on the areas' designed uses. The sections ranged from structural road section to landscaping. Soil was nominally placed in 8-inch lifts and dynamically compacted to the designed relative compaction specification and elevation. Three types of import soil were used for cover material; common fill (7,377 cy), ¾-inch-minus crushed base (6,581 cy), and top soil (4,024 cy). The City Service Road was realigned and replaced with a minimum 8-inch thick sub-base using 3-inch minus crushed rock, followed by a 10-inch layer of ¾-inch minus sub-base coarse. Details of the cross sections are shown in the OU1 as-built drawings provided in Appendix B.

Restoration activities began with the placement of the visual barrier on October 4, 2011. Import soil placement and compaction began on October 7, 2011 and the visual barrier placement advanced ahead of soil placement across the site. Site soil cover placement was completed on June 29, 2012.

3.4 Erosion and Stormwater Control

All excavated areas were either hydroseeded (272,592 ft²) by a landscape contractor or received a structural base material (167,328 ft²) to stabilize the surface soils from erosion. Erosion matting (35,856 ft²) was also placed on the embankment areas that were excavated. Structural base material placement was staged as part of the import soil placement, hydroseeding, and tree planting which was completed on June 29, 2012. Drainage features were also incorporated into the design in the form of

swales discharging into trench drains and sumps to manage stormwater runoff. These measures will help to ensure that the Selected Remedy remains protective of human health and the environment. Ongoing O&M includes routine visual inspections of the erosion control materials and communication with the City on work in and around OU1.

Construction as-builts for OU1 are presented in Appendix B.

3.5 Demobilization

Equipment used during construction activities was decontaminated, as necessary, and demobilized from the site as soon as that particular piece of equipment was no longer needed. As a result, demobilization from OU1 occurred throughout RA construction activities. The final demobilization date was June 29, 2012, as documented in the QAR in Appendix D.

3.6 Design Modifications During Construction

During the removal and restoration activities, unforeseen conditions were encountered and design revisions were made. Consequently, forty design modifications were made over the course of the project. Design modifications were executed by the RC in real time with no delay impact to the project. Some of the major modifications are as follows:

- Mod #6: increased the thickness of the road-base materials from 6 inches of ¾-inch minus base to 10 inches of ¾-inch minus crushed base course;
- Mod #18: as indicated on the as-builts, marker barrier was placed in limited areas of the David Thompson Search and Rescue parking area in accordance with an earlier revision of the design documents;
- Mod #19 and #21: modified the excavation depths to avoid damage to shallow utilities;
- Mod #24: replaced 8 inches of common fill with 6 inches of topsoil on embankments; and
- Mod #40: Enlarged two rock trench drains along western boundary of Area 1.

The Change / Modification log and copies of the modifications are found in Appendix E.

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Section 4

Chronology of Events

This section presents a tabular summary that lists the major events for the Site OU1 RA project and associated dates of these events beginning with the ROD signature. See Section 2.1 for a summary of all investigation and removal activities that occurred prior to the ROD.

Date	Event
May 10, 2010	ROD for OU1 Signed
August, 2011	Remedial Design Complete
August 9, 2011	Mobilization and Site Preparation
August 16, 2011	Start of Excavation
March 13, 2012	Area 2 River Bank Revetment Complete
April 26, 2012	Area 3 Remedial Excavation Complete
June 15, 2012	Area 1 Remedial Excavation Complete
June 29, 2012	Area 1 Remedial Restoration Complete
June 29, 2012	Area 3 Remedial Restoration Complete
August 8, 2012	Joint Site Inspection
August 10, 2012	Area 2 Boat Ramp Restoration Complete
August 10, 2012	Final Restoration Inspection
October 3, 2012	Construction As-Builts Submitted to City
TBD	O&M Plan Approval
Summer 2013	OU1 Post-Construction Risk Assessment Sampling
TBD (estimated Summer 2014)	First Annual Site Inspection
TBD	Institutional Control Implementation and Assurance Plan (ICIAP) Approval
TBD	OU1 Post-Construction Risk Assessment Report
TBD	Site-wide Risk Assessment Report
TBD	O&F Determination/Start of O&M Phase
TBD	First Annual O&M Site Inspection
TBD	First Annual O&M Report
TBD	First Five-Year Review

TBD – to be determined

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Section 5

Performance Standards and Construction Quality Control

This section describes the overall performance of the removal and containment remedy in terms of comparison to the OU1 site remedial action objectives. In addition, this section discusses the remedy performance monitoring strategy and QA/QC procedures followed.

5.1 Comparison to RAOs

The RAOs for the OU1 site are presented in Section 2.2.1. This section presents a brief summary of the current conditions as compared to the RAOs. Upon completion of the OU1 post-construction risk assessment, the EPA will verify that all RAOs are still met.

The confirmation soil sample analytical results from the removal activities indicate that the majority of the site's exposed finish subgrade is at concentrations <1% LA. Figure 3-1 shows the concentrations and depths of LA remaining across all of OU1. In the areas with residual contamination, the in-place cover is sufficient to break the exposure pathway. This accomplishes the RAO of mitigating the potential for inhalation exposure to asbestos fibers that would result in risks that exceed the target cancer risk range of 1E-06 to 1E-04. However, the EPA will conduct a post-construction risk assessment at OU1.

Restoration activities at OU1 included placement of cover and seeding or re-vegetation, and in some cases, placement of rip-rap and/or erosion control matting. These measures address the second RAO to control erosion of contaminated soil by wind and water from source locations to prevent the spread of contamination to unimpacted locations. Section 7 provides a brief description of OU1 O&M measures in place to ensure that the Selected Remedy remains protective of human health and the environment.

The final RAO to implement controls to prevent uses of the site that could pose unacceptable risks to human health or the environment or compromise the remedy will be addressed by the implementation of ICs for OU1. An Institutional Control Implementation and Assurance Plan (ICIAP) will be developed to address implementation and periodic review of the specific IC instruments for OU1. This is discussed further in Section 6.3.

5.2 Remedy Performance Monitoring Strategy

The ROD included monitoring as a component of the Selected Remedy to ensure long-term effectiveness and permanence. The remedy performance monitoring strategy includes inspections and reviews (EPA 2011c). During the site inspections, current site conditions — including drainage, signs of erosion and integrity of the cover — will be observed and documented. Monitoring of the ICs will include evaluations of the effectiveness of the ICs implemented by the ICIAP. Section 7 provides a brief description of OU1 O&M measures in place to ensure that the Selected Remedy remains protective of human health and the environment.

Five-year site reviews will be conducted by the EPA (as required by the National Oil and Hazardous Substances Pollution Contingency Plan due to contamination left-in-place) to ensure that the remedy as implemented and maintained continues to be protective of human health and the environment.

5.3 Construction QA/QC

During RA construction, TQA personnel were tasked with documenting if construction activities were performed in accordance with the RAWP and design drawings. TQA personnel recorded observations on a daily basis in the QARs. Deviations from the guidance documents were recorded in the Change / Modification log discussed in Section 3.6. Upon completion of construction activities, the restoration final inspection (RFI) was conducted. TQA and RC staff walked through the site on August 10, 2012 to determine if the scope had been completed in a satisfactory manner. This inspection, which did not identify any deficiencies, was noted in the QAR provided in Appendix D.

A joint site inspection (JSI) by the EPA, DEQ, RC, and TQA representatives also occurred on August 8, 2012. A detailed account of these QA/QC assessments is presented in Section 6.1.

5.4 QA/QC Procedures

QA/QC measures for this remedial action included, but were not limited to, appropriate training of sampling and inspection personnel, the collection of field QC samples (such as duplicate soil samples and field blanks), implementation of a laboratory QA program (implemented for the entire Site), review of this report by an approved CDM Smith QA staff member, and audits to evaluate adherence to project requirements and procedures outlined in relevant site guidance documents.

Section 6

Final Inspections and Certifications

6.1 Remedial Action Contract Inspections

This section provides a description of all contract inspections, including field audits, the RFI and the JSI.

6.1.1 Field Audits

Daily field audits, or follow-on inspections, were performed by the TQA. The RAWP (USACE 2010a) required that these inspections be conducted at least once per day at each work site for each phase of work. Work practices, compliance with plans and specifications, compliance with safety, and efficiency were reviewed and recorded on the daily QAR. Any deficiencies noted were immediately communicated to the task foreman for resolution.

All RA construction activities were conducted in accordance with the RAWP and design drawings. No major deficiencies were identified during the daily audits. All QARs for the remedial action are provided in Appendix B.

6.1.2 Restoration Final Inspection

The Restoration Final Inspection was conducted on August 10, 2012 following the completion of restoration activities (with the exception of hydroseeding near the boat ramps, which was not completed until August 14, 2012.) This inspection provided an opportunity for the City, RC, and TQA to meet onsite and identify any non-conformance with the work plan. In this case, no deficiencies were identified by the City, RC, or TQA. This RA was completed in accordance with the RAWP and design drawings.

6.1.3 Joint Site Inspection

Representatives from the EPA, DEQ, RC, and TQA met at the site on August 8, 2012 to conduct a JSI. The results of this inspection were reported in the OU1 JSI Memorandum (CDM Smith 2012). This type of inspection is typically conducted at the conclusion of construction at a given site and is required before an O&F determination can be made.

During the JSI, attendees observed current site conditions and reviewed previous remediation/restoration activities. Attendees agreed that construction activities were completed in accordance with the Selected Remedy outlined in the OU1 ROD, RAWP and design drawings. However, due to the current lack of toxicity data for LA, an O&F determination was not made and, as agreed by JSI attendees, will be deferred until the OU1 post-construction risk assessment sampling is completed. A copy of the JSI Memorandum is provided in Appendix F.

6.2 Health and Safety

All activities conducted at the Site are subject to conformance with the Comprehensive Site Health and Safety Plan (CHASP) (CDM Smith 2011). Included below is a brief description of significant health and safety measures implemented during the RA. For details, reference the CHASP.

During construction, water-based dust suppression was used to prevent asbestos fibers from becoming airborne. This alleviates cross-contamination concerns by preventing offsite migration of fibers. Also, dust suppression provides additional respiratory protection for laborers working within the contaminated areas. To prevent migration of fibers during transport, containerized truck beds and trailers are used.

During the RA, all personnel on site used proper personal protective equipment (PPE), as documented in the QARs. A minimum of modified level D was worn on the site at all times, including safety shoes, safety glasses, and hardhats. Personnel entering the exclusion zone wore modified level C, including safety shoes, safety glasses, disposable coveralls, hardhats, and half or full face respirators (depending on intrusiveness of activity). Personnel exiting the exclusion zone went through a thorough decontamination process in the shower trailer located in the contamination reduction zone. Additionally, the clean room of the decontamination shower trailer was regularly monitored for potential LA fiber migration, with all 12 ambient air samples ND for LA by TEM (see Appendix C).

Perimeter air samples were collected from the downwind side of excavation areas during all removal activities to monitor for offsite migration of LA. All of these air samples were ND for LA by TEM. Results of the perimeter air samples are included in Appendix C. The CHASP also requires bi-annual personal air monitoring for operators and laborers performing removal activities; however, this is a site-wide requirement that was also satisfied at other locations on the Site. For the 13 personal air monitoring samples collected for OU1 site workers during RA activities, PCM results indicate levels within OSHA permissible exposure limits (see Appendix C).

6.3 Institutional Controls

ICs are non-engineering measures designed to prevent or limit exposure to hazardous substances left in place at a site, or assure effectiveness of the chosen remedy. ICs currently in-place at OU1 include:

1. One Call Locate Center – Any excavation requires a call to Montana's One-Call underground facility location service (U-Dig) for Lincoln County to identify the potential for buried facilities. For an excavation within the Superfund Site boundary, a call to U-Dig also prompts the Environmental Resource Specialist (ERS) program to identify the potential for residual asbestos contamination on the property.

2. Permit - Any excavation within the MDT right of way requires a permit from MDT. That permit includes information about the potential to encounter asbestos contaminated soil.

The EPA is also evaluating further proprietary/legal controls for each portion of the OU. All final ICs for OU1 will be compiled in the ICIAP.

Once established, the ICs will be evaluated and updated on an annual basis by DEQ. DEQ will conduct this work under the Cooperative Agreement, if amended, and following entry into the O&M period. The evaluation will assess whether the selected IC instruments remain in place and whether the ICs are enforced such that they meet the stated objectives and performance goals and provide protection

required by the response. Five-year site reviews performed by the EPA will also periodically evaluate the effectiveness of the ICs as they are implemented and maintained.

The following are the IC categories. For more information on these ICs, refer to the ICIAP (EPA 2012a). The ICIAP identifies the specific IC instruments implemented for the Selected Remedy.

- **Proprietary Controls** - Proprietary controls have their basis in real property law and generally create legal property interests (EPA 2000a). Potential IC instruments considered for this remedial action in the OU1 ROD include an environmental covenant, easement, or deed notice.
- **Governmental Controls** – Government controls impose restrictions on land use or resource use, using the authority of a government entity (EPA 2000a). All future land use is anticipated to be residential and/or commercial.
- **Informational Devices** – Informational devices could provide information or notification to local communities that residual or contained contamination remains on site (EPA 2000a). The EPA anticipates that an important component of the informational devices will be an agreement with the utility-locate service, U-Dig, to add areas of subsurface contamination to their database of underground hazards.
- **Enforcement and Permit Tools** – Enforcement and permit tools are legal tools, such as administrative orders, permits, Federal Facility Agreements (FFAs) and Consent Decrees (CDs), that limit certain site activities or require the performance of specific activities (EPA 2000a). The establishment of enforcement and permit tools is not anticipated at the time of the development of this report.

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Section 7

Operation and Maintenance Activities

This section summarizes the general activities for post-construction operation and maintenance. This section also summarizes re-evaluations that will ensure that the Selected Remedy remains protective taking into account future risk assessment data. Detailed information regarding operation and maintenance for the OU1 site is provided in the Draft O&M Plan (EPA 2013).

7.1 Long-Term O&M Activities

Long-term O&M will be performed to maintain the integrity of the remedy components, including protective covers and ICs, after OU1 is determined to be operational and functional. The O&M Plan will define the responsibilities for long-term O&M of the remedy and repairs. The following subsections summarize what will be considered routine O&M activities.

7.1.1 Routine Site Inspections

Routine non-intrusive visual site inspections will be conducted to ensure integrity of the covers and backfilled areas. OU1 site inspections are assumed to be performed at least annually as well as concurrently with the five-year site review.

7.1.2 Cover Maintenance

The main concern during the O&M period will be future encounters with contaminated soil resulting from damage to the remedy. Damage to covers and backfilled areas identified during routine OU1 site inspections will be repaired to eliminate exposure of underlying contamination. Issues that may arise with the covers during long-term O&M and contingency plans for such occurrences are detailed in the Draft O&M Plan.

7.1.3 U-Dig Review

U-Dig call data will be evaluated for accuracy and validity as calls are received to ensure protectiveness. Evaluation of U-Dig calls is discussed in the OU1 O&M Plan.

7.1.4 IC Evaluation and Updates

ICs will be evaluated on at least an annual basis and updated if necessary to ensure protectiveness. Evaluation and updates for different types of ICs are discussed in the OU1 O&M Plan.

7.1.5 Reporting

Routine reports summarizing O&M activities will be prepared by the DEQ and submitted to the EPA on an annual basis. Routine reporting also involves regular review and updates as necessary to the O&M Health and Safety Plan (HASP). Reporting requirements are discussed in the OU1 O&M Plan.

7.2 Five-Year Reviews

Five-year site reviews of the OU1 site will be performed since contaminated subsurface soil is left in place below the protective covers and backfilled excavations, preventing unrestricted use of the OU1 site. The EPA is responsible for performing and funding the five-year reviews as long as they are required.

The five-year review process consists of six components: 1) community involvement and notification; 2) document review; 3) data review and analysis; 4) site inspection; 5) interviews; and 6) protectiveness determination (EPA 2001), (EPA 2003).

- Community involvement activities will notify the public that the five-year review will be conducted, that it has been completed, and that results are available for review at the EPA Information Center in Libby.
- Document review involves an evaluation of all relevant documents and data to obtain information to assess the performance of the remedial action.
- Site inspections will be conducted to gather information about the site's current status and to visually confirm and document the conditions of the remedy, the site and the surrounding area.
- Interviews may be conducted as necessary with the site manager, site personnel and people who live or work near the site to gather additional information about the site's status or to identify remedy issues.
- The protectiveness determination should include a technical assessment of the following questions:
  - Is the remedy functioning as intended by the decision documents?
  - Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?
  - Has any other information come to light that could call into question the protectiveness of the remedy?

7.3 OU1 Post-Construction Risk Assessment Re-Evaluation

When the OU1 post-construction risk assessment is complete, the EPA will re-evaluate the remedy to confirm its effectiveness. If unacceptable exposures are identified, the EPA will take action as necessary to ensure that the soil-to-air pathway is broken. Actions may include additional excavation (to a maximum of 3 feet), improving covers, and/or strengthening ICs. If contamination continues below 3 feet, a visible barrier marking the extent of excavation will be placed before backfilling.

Section 8

Summary of Project Costs

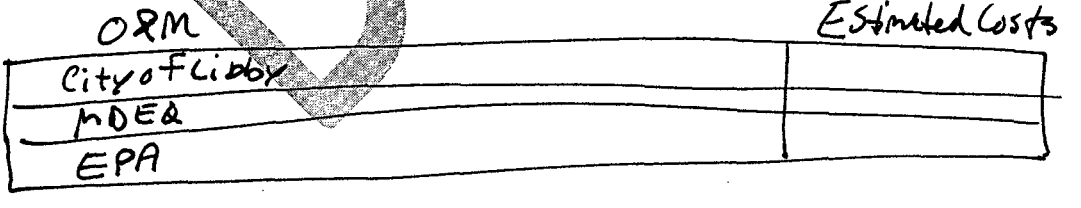
Consistent with EPA guidance (EPA 2000a), a summary of project costs is provided within this RA report. According to the guidance, the total project costs are to be compared to the estimates presented within the ROD. It should be noted that this section provides project costs for the 2011/2012 remedial action only. The costs associated with previous removal actions are not considered because those removal actions were conducted under Comprehensive Environmental Response, Compensation, and Liability Act removal authority rather than remedial authority.

All capital costs in the comparison table below are reported in the same dollar basis as the actual project costs (i.e., 2012 dollars). The capital costs projected in the ROD were escalated to 2012 dollars using the USACE Civil Works Construction Cost Index System (USACE 2012). Because O&M costs have not been incurred and will not be compared, the ROD projections for annual O&M costs and periodic costs remain in 2010 dollars. Appendix A provides a summary of actual capital costs associated with construction activities (earthwork).

	Projections in ROD	Actual Costs
Capital Cost (ICs and Engineered Controls)	$61,000	Not yet incurred
Capital Cost (Earthwork)*	$3,467,000	$2,813,190
Annual O&M Cost and Periodic Cost (Five-Year Reviews)	$955,000	Not yet incurred

*ROD projections escalated to 2012 base year

The incurred total capital costs associated with the RA were less than projected in the ROD. In large part the reduction in cost is due to cost savings in technical support which included remedial design, project management, and construction management. The cost estimate for the preferred alternative assumed approximately $880,000 (escalated to 2012 base year) for technical support. The technical support costs for the preferred alternative were based on EPA guidance for estimating indirect costs (EPA 2000b) using percentages applied to the total estimated construction costs. As shown in Appendix A, only $383,025 was spent on technical support. However, the actual technical support costs do not include costs incurred by the EPA and USACE.



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Section 9

Observations and Lessons Learned

This section provides observations and lessons learned from implementation of the Libby OU1 RA construction activities including successes, problems encountered, and resolutions.

9.1 Successes

OU1 posed a unique relationship with the City, relative to the other OUs, where the City retained a designer to develop and propose the park finish grade elevations and features. The USEPA established removal and restoration limits based on the City's proposed final grade elevation. This approach required significant City involvement and participation in finalizing plans prior to and managing modifications during construction. A City council representative was delegated as the point of contact and responsible for conveying project issues to their designer. The request for information, design modifications, and material submittal approval processes went smoothly with no impact to construction schedule.

The greater majority of other OU protocols was to uniformly remove contaminated soil to a specified depth below original grade and restored in kind. Because OU1 proposed finish grade elevations varied across the site the depth of excavations likewise varied accordingly. Subsequently, a staked grid of 25-feet on-center was surveyed and each point stake was labeled with depth of excavation. The excavator operators interpolated between stakes to establish proposed topography. The system proved effective to achieve proposed depth of excavation and mitigate unintended over-excavation while achieving the minimum 18 inches of imported soil cover.

Due to the OU1 areal expanse, over 200 confirmation soil samples were anticipated. The USEPA requested laboratory analysis on a 24-hour turn-around basis to accommodate the fast-track removal process. When analytical results exceeded 1% LA, the excavation crews were able to efficiently and effectively return to those discrete polygon removal areas to over-excavate without cross-contaminating cleared polygons. This protocol required a number of individuals and systems to closely communicate and coordinate.

9.2 Problems Encountered and Resolutions

The EPA was evaluating and adjusting restoration materials sections to maximize cost efficiency. Consequently, at other OUs, the top soil section was revised from 6 inches to 4 inches. However, during OU1 embankment restoration, it was determined that the 4-inch section was insufficient for grass seeds to substantially establish. Therefore, 6 inches of top soil was restored to the OU1 embankments.

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Section 10

Libby OU1 Contact Information

Contact information for the key OU1 RA project personnel is presented below.

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Section 11

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Figures

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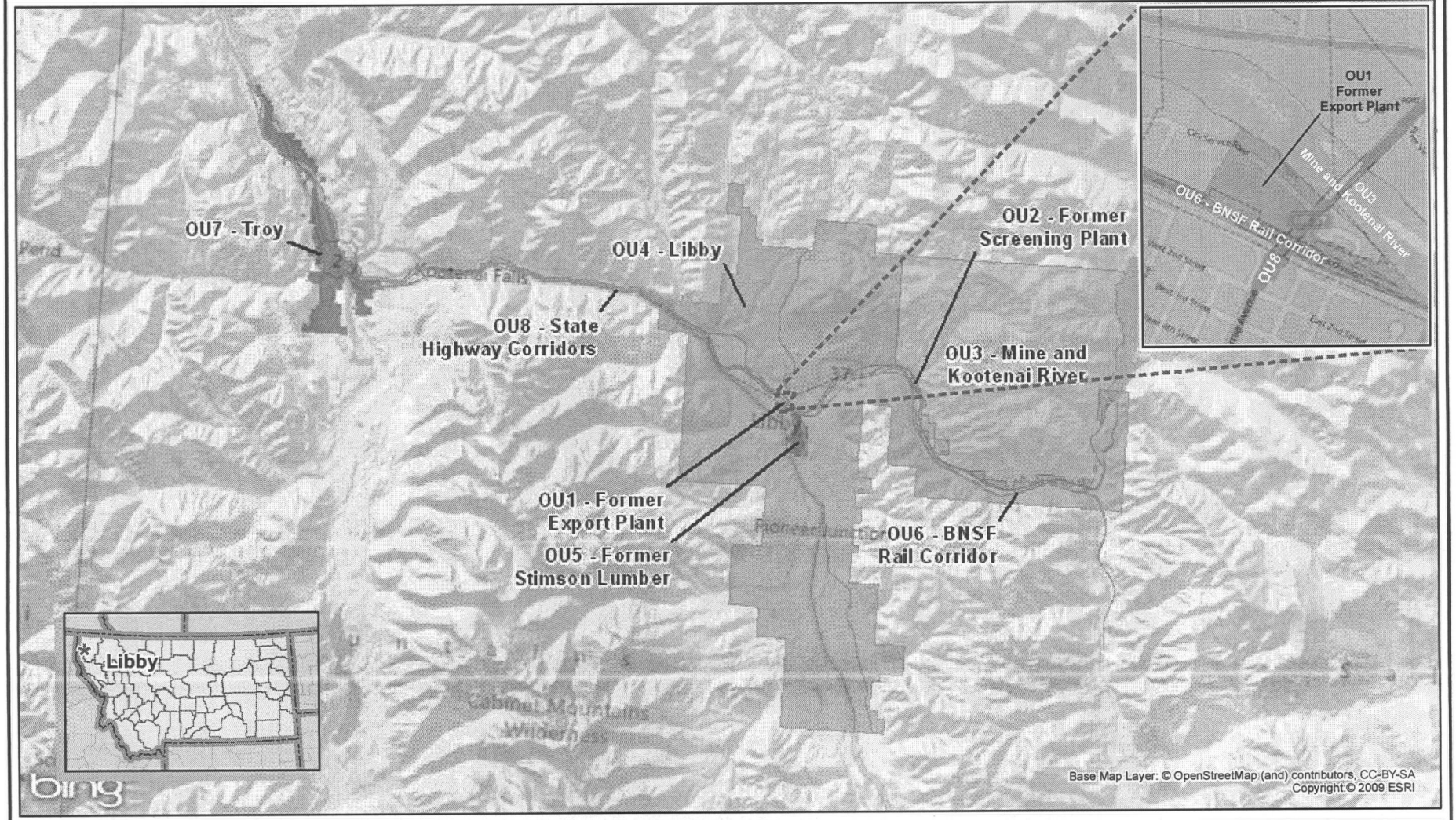


Legend

- NPL Boundary
- OU1 - Former Export Plant
- OU2 - Former Screening Plant
- OU3 - (Study Area) Mine and Kootenai River
- OU4 - Libby
- OU5 - Former Stimson Lumber
- OU6 - BNSF Rail Corridor
- OU7 - Troy
- OU8 - State Highway Corridors

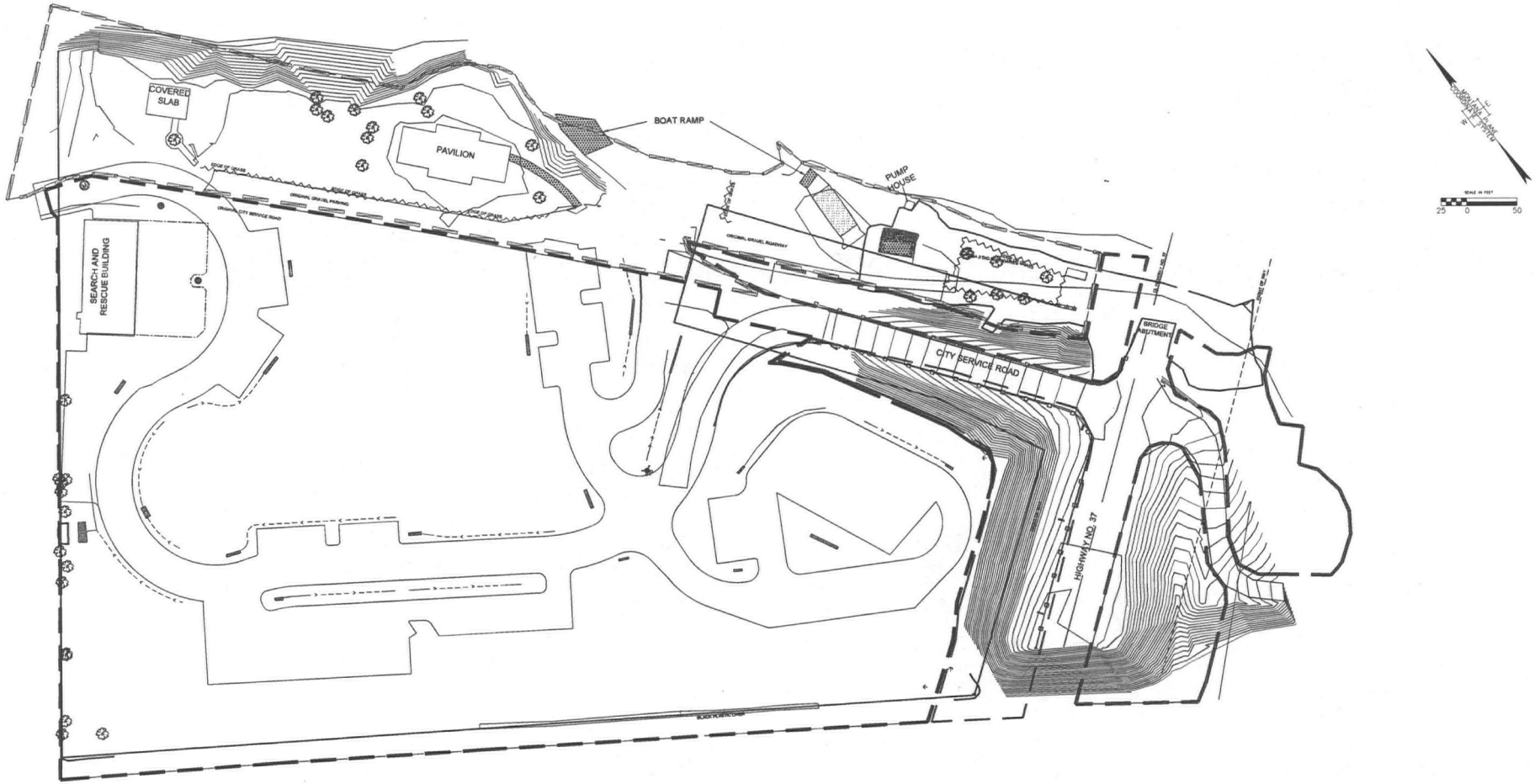
N

0 2.5 5 10

Miles
1 inch = 5 miles

Figure 1-1
Operable Units
Libby Asbestos Superfund Site
Lincoln County, Montana

CDM Smith



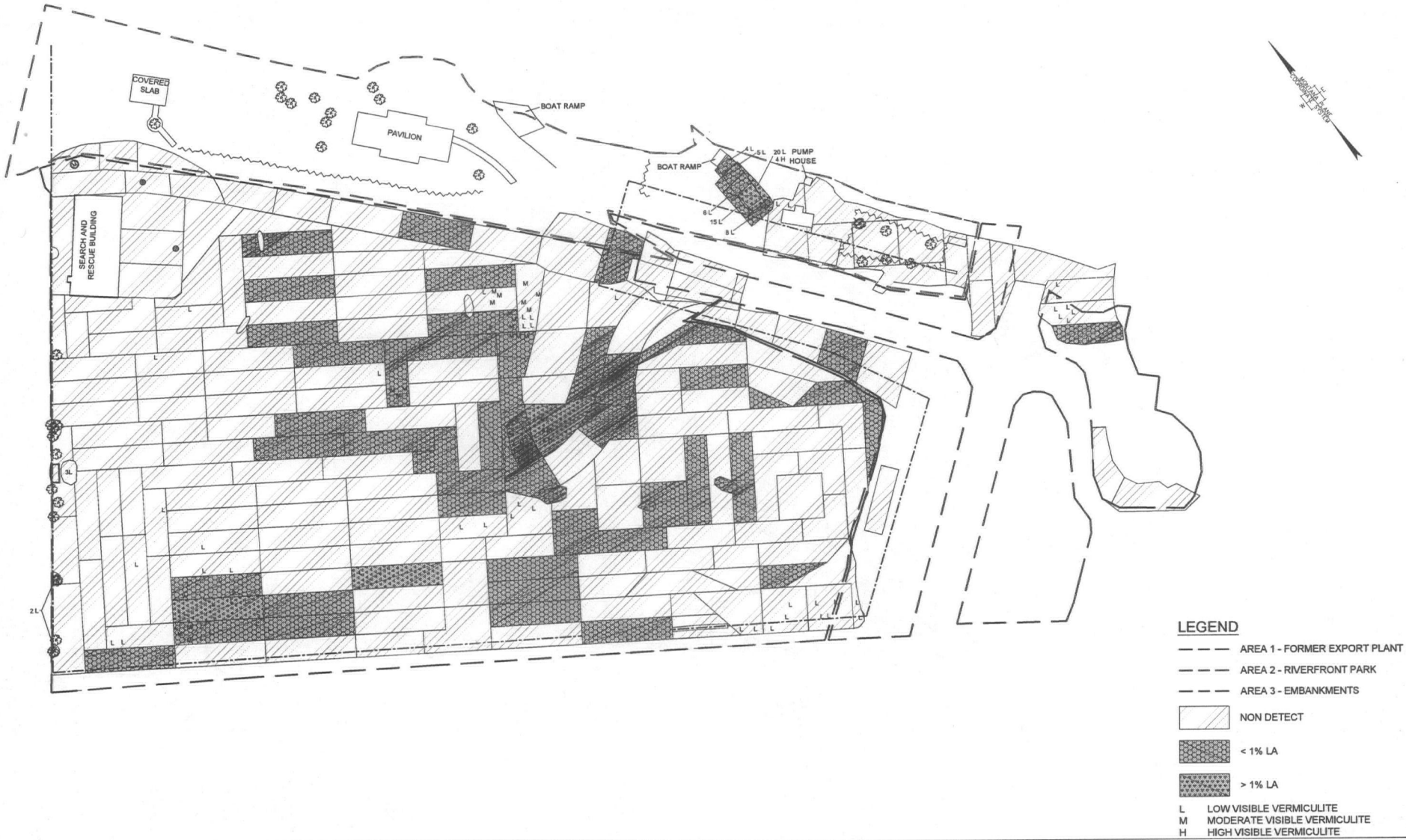
LEGEND

- AREA 1 - FORMER EXPORT PLANT
- AREA 2 - RIVERFRONT PARK
- AREA 3 - EMBANKMENTS

SCALE IN FEET
25 0 50

OU1 SITE MAP
FIGURE 1-2
LIBBY ASBESTOS SUPER FUND SITE
LINCOLN COUNTY, MONTANA

CDM Smith
CDM Federal Programs
69 Port Boulevard
Libby, MT 59923
Tel: (406) 293-6595



LOCATION OF RESIDUAL CONTAMINATION AT OU1 OVERVIEW
FIGURE 3-1
LIBBY ASBESTOS SUPER FUND SITE
LINCOLN COUNTY, MONTANA

SCALE IN FEET
25 0 50

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CDM Federal Programs
60 Port Boulevard
Libby, MT 59923
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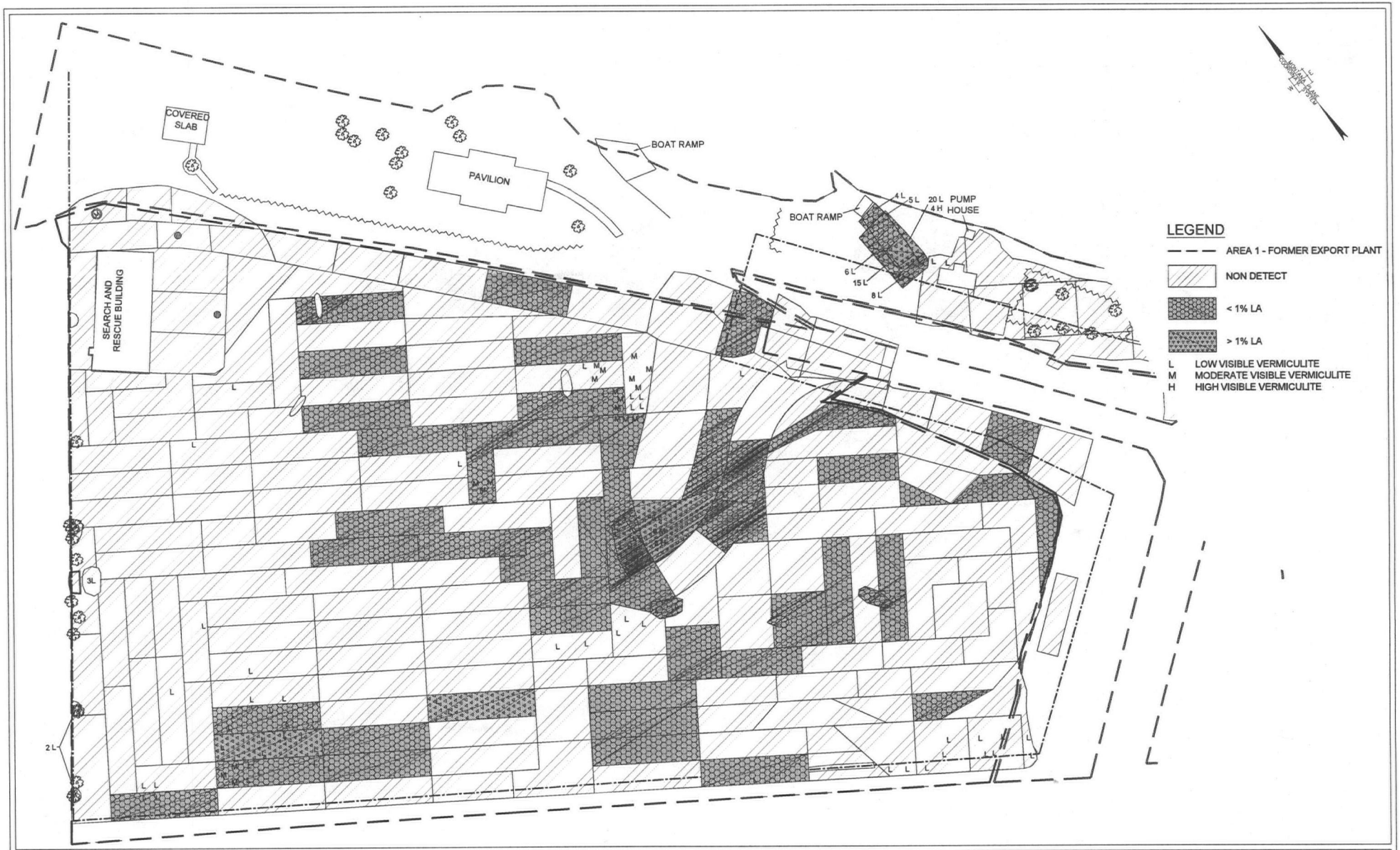

LOCATION OF RESIDUAL CONTAMINATION AT OU1 AREA 1
FIGURE 3-2
LIBBY ASBESTOS SUPER FUND SITE
LINCOLN COUNTY, MONTANA

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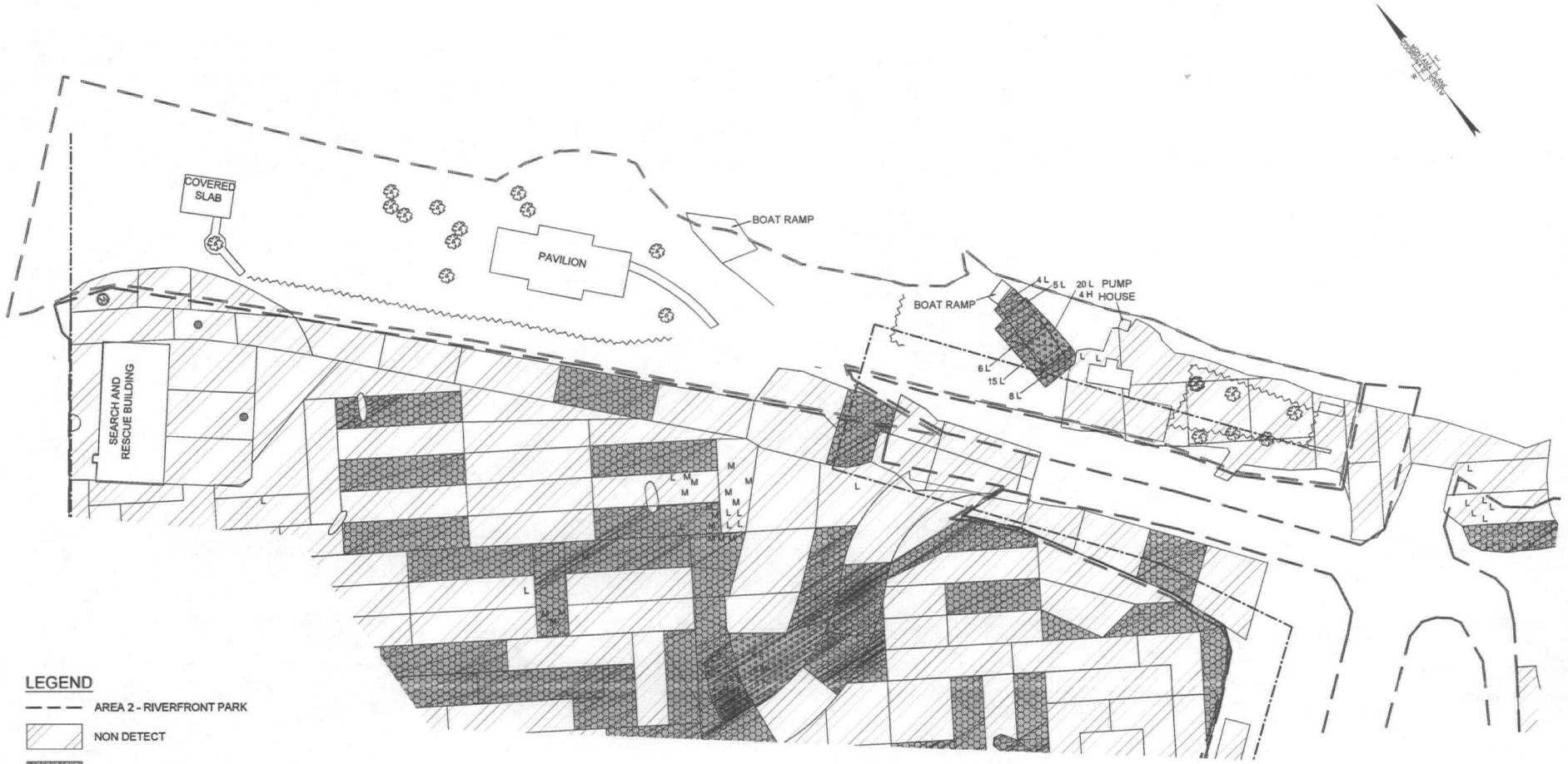

LOCATION OF RESIDUAL CONTAMINATION AT OU1 AREA 2
FIGURE 3-3
LIBBY ASBESTOS SUPER FUND SITE
LINCOLN COUNTY, MONTANA

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LOCATION OF RESIDUAL CONTAMINATION AT OU1 AREA 3
FIGURE 3-4
LIBBY ASBESTOS SUPER FUND SITE
LINCOLN COUNTY, MONTANA

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Appendix A

Cost Summary

Appendix B

OU1 As-Builts

Appendix C
Analytical Results

Appendix D

RA Construction Documents

Appendix E

Change / Modification Logs

Appendix F

Joint Site Inspection Memorandum